TECHNOLOGY DEPT.

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January 6, 1944

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From _____

_____

To _____

_____

Signed _____

AMERICAN MACHINIST —chips

Happy New Year . . . By now you are probably trying hard to get those resolutions into effect, but this is our nearest chance to wish you the best of luck in 1944—probably one of the most critical years any of us is likely to face. It's bound to be much different from 1943, for wars and rumors of war and peace are crowding in on each other to a degree where it is a smart man who knows in which direction to look.

However, with all our confusion, we probably have something of an advantage over those in the Metal-Working industry who faced the new year 66 years ago, in 1878. We quote from *American Machinist* of that da-:

"The electric light is one of the greatest mechanical studies of the day. It would be difficult to estimate how many hundreds or perhaps thousands of people are now devoting their attention to its development. Prof. Edison has electrified the civilized world with the announcement of what he can accomplish with it, and the gas companies are uneasy over the prospect of diminished receipts and danger to the monopolies they possess. There is no doubt that the electric light is a success, but how general may be its use and how cheap the cost of sustaining it are problems many enterprising inventors are trying to solve."

o

Squeeze Play . . . *We were delighted to give the Department of State permission to condense* AMERICAN MACHINIST *into microfilm form for shipment to China. In connection with its program of cultural and technical assistance to our Eastern Ally, the Department plans to send to universities and other research centers in that country scientific and technical textbooks, reference works and learned journals.*

Because of the difficulties of transportation, bulk paper cannot make the trip. Microfilm of AM and many other urgently needed sources of information will open a new industrial front in China.

o

Getting Hot . . . They say "where there is smoke there is fire," and even the casual readers of today's press can see that many smoke signals are spelling out the imminence of reconversion to the manufacture of civilian goods. Even the experts seem to be slightly baffled as to the exact "who, when and where," but something is certainly cooking. Excesses of raw materials, cut-backs in some forms of munitions and desire for a maintenance of labor employment are all heating the pot. Best advice we can give is to keep your eyes and ears open.

Everybody knows that while Americans want the war effort to come first, the lack of certain civilian products is beginning to pinch. What everyone doesn't know is that Americans by and large now have the money with which to buy the durable goods they need—money which in many cases is now being spent on $30 night gowns and $1,000 mink coats. According to the magazine, *Sales Management*, the per capita income for the U. S. has reached $1,054. Mind you, that is for every man, woman and child. At the rate of something like 4½ persons per family, it means that the average homestead has $5,000 bucks coming in.

o

Armament Sections . . . *Comes to hand a plea from the Johannesburg (South Africa) Public Library. It seems that due to censorship, our every-issue Armament Sections have had to be deleted from issues going to that part of the world. We are asked to reserve all such missing pages so that we may send them at the close of the war, and thus bring their files up to date. Will do.*

o

Reprint Service . . . A friend horrified us the other day when he proudly said that he tore many issues of *American Machinist* apart in order to file special editorial features like Tools of Our Trade, Working of Materials Sections and Armament Sections.

This is very gratifying indeed, but let it be known to one and all that almost every such feature section in AM is made available in reprint form—which may be had for the asking, usually plus a few pennies.

When you see something you especially like or need in *American Machinist*, ask us for a reprint before you start tearing apart your copy. Then you can pass it on intact.

o

Post-War Peek-a-Boo . . . *We understand that Farnsworth Television & Radio Corp., pioneers in television, recently advertised a new wrinkle: Systems installed in factories after the war will enable executives in the front office to view what's happening in any department at any time. This is great stuff, but we can't help wondering what the boys in the back room will think of it.*

Zenith, too, comes into the news with a bang by announcing their new low-priced hearing aid. Our pre-war frontiers of manufacture are no more.

o

Complaint Department . . . Occasionally in these days of uncetain mailing we get justifiable complaints that copies of AM do not reach readers exactly on time—and they *have* been known to be somewhat the worse for wear.

We always feel badly about this, but not quite so sad as the young lady in the Pittsburgh branch of the Federal Reserve Bank who answered a request for a $25,000 bond by sending an astounded American $2,500,000 worth. That's an error what *am* an error!

o

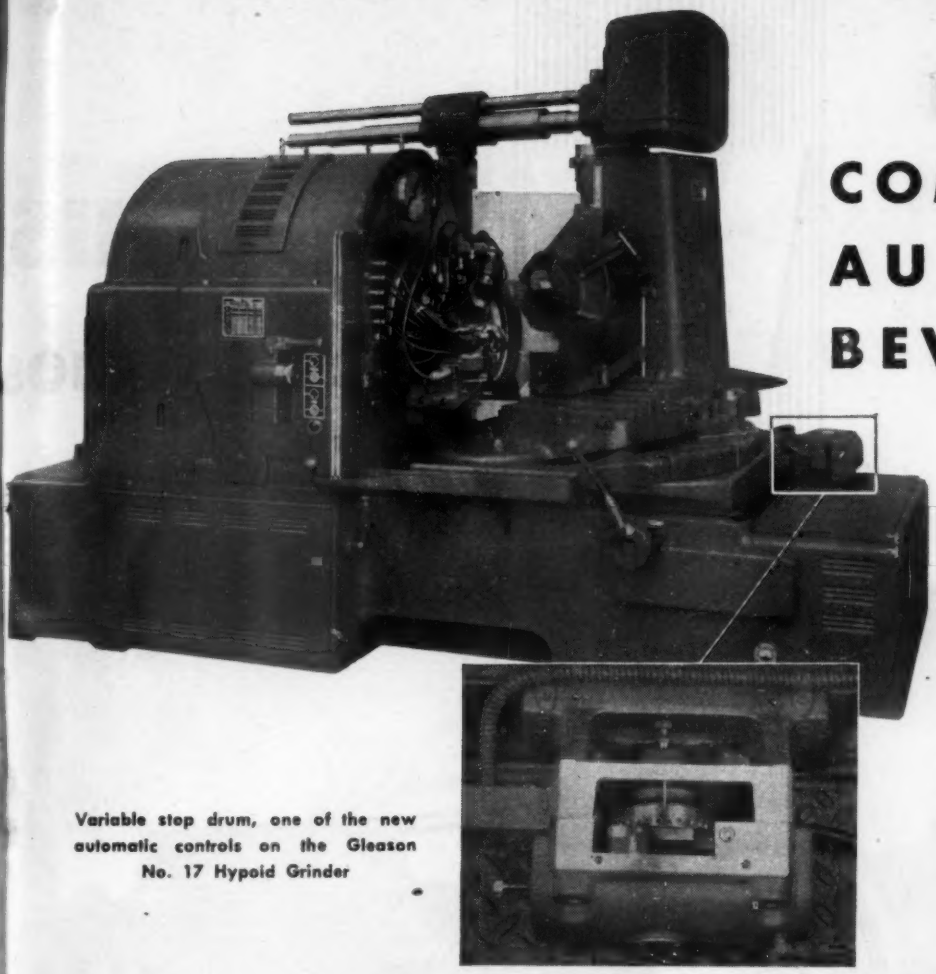
Heat-Treating Forecast . . . *Rupert LeGrand, AM Associate Editor, passes on this observation: In heat-treating equipment—retorts, boxes, fixtures and furnace parts subjected to high heat—manufacturers have been forced by the alloy situation to use lean-alloy materials that are not serviceable. Say 400 hours life and perhaps up to 2,000. In post-war, when pennies will count, such items must give something like 7,000 hours life. This forecasts a big market for more efficient furnaces. In the past few hectic war years no one has cared much about life or efficiency, but from now on the story should be different.*

o

Simplified Training . . . We learn from the War Manpower Commission that one of their articles by Hugh H. Samuel, special field representative of their Apprentice Training Service, has been successful in stimulating employee morale. One company ordered reprints of the article, which appeared in the September 30 issue of *American Machinist*. Each employee was given a copy and the president of the firm stated that he is amazed at the results of the article in adding to the high morale of his firm's employees.

o

Coming Next Issue . . . *Pick out a handy spot right now in which to keep your copy of the January 20 issue of* AMERICAN MACHINIST. *This will be the 31st Annual Buyers Reference Number and will give you in compact form a review of all the new Metal-Working products introduced through AM during 1943. It will also bring you, in greater measure than ever before, a quality of helpful advertising that in itself will serve as a buyers guide for months to come.*



Variable step drum, one of the new automatic controls on the Gleason No. 17 Hypoid Grinder

NOW! COMPLETELY AUTOMATIC BEVEL GEAR GRINDING

for

- highest precision
- fast production
- interchangeability
- ease of operation

Add **this** to the list of advantages found in grinding the teeth of spiral bevel, Zerol bevel and hypoid gears: **completely automatic operation**. The Gleason No. 17 Hypoid Grinder is now entirely automatic. Once the machine is set up, all the operator need do is change the work and push the start button. Mechanical controls regulate the whole machine cycle, including wheel dressing and in-feed of the gear blank — the variable human element is eliminated.

This new development presents these important advantages:

1. Highest precision at mass production rates.
2. Exact duplication of results from gear to gear, and lot to lot.
3. True interchangeability of gears.
4. Vastly shortened training time for operators.

Your plans for present and future bevel gear production can not be complete until you have investigated the possibilities of automatic grinding. Write for our leaflet on the No. 17 Grinder. We will be pleased to show you how this machine will fit your production program.

GLEASON

GLEASON WORKS

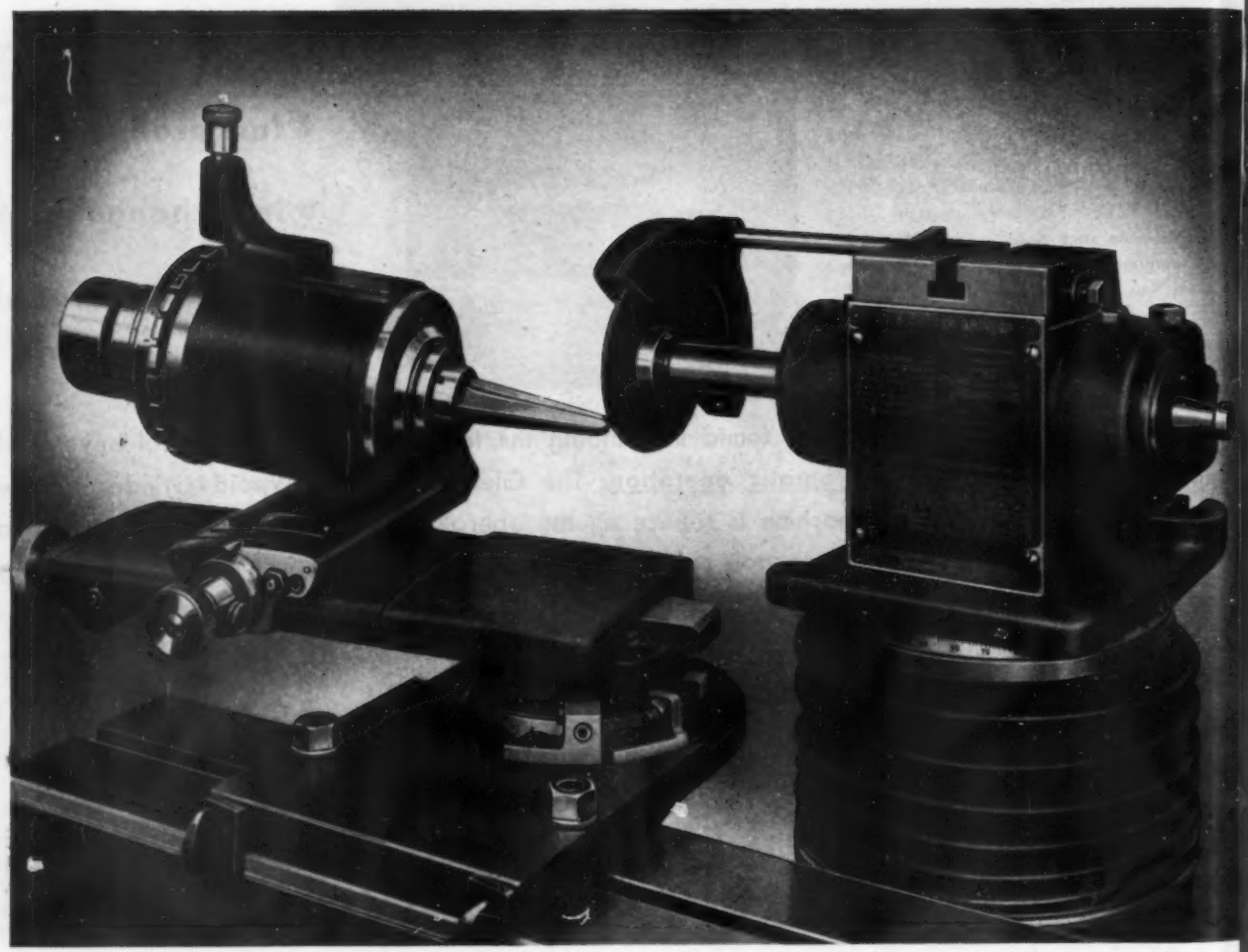
Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

CINCINNATI

WITH THIS

BALL-NOS



Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

THE CINCINNA

MILLING MACH

ATTACHMENT YOU CAN SHARPEN

AND DIE SINKING CUTTERS • • •

on your plain cutter grinder

Now you can add die-sinking and ball-nose cutters, double-end cutters, and tracer fingers to the long list of cutting tools which may be quickly and accurately sharpened on your CINCINNATI No. 2 Cutter and Tool Grinder. ¶ This is made possible through the development of the CINCINNATI No. 1 Radius Grinding Attachment illustrated on the opposite page. Its usefulness and suitability for sharpening cutters in your own shop may be judged by the following specifications: Capacity, ball-nose cutter . . . 4″ diameter. Will grind radii of 0 to 2″. Swivel range, 360 degrees. Taper in spindle . . . No. 12 B & S. Capacity with collets for straight shank cutters . . . ⅛″ to 1¼″. Spindle speed when motor driven, 287 r.p.m. Index plate has 24 notches. ¶ The engineers here at Milling Headquarters who developed this attachment will be glad to send complete details. Bulletin M-1179-2 tells the whole story. Write for your copy today.

CINCINNATI *No. 2 Cutter and Tool Grinder. Complete description and specifications for these machines, in addition to data on all attachments, may be obtained by writing for catalog M-962-1*

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

THE FORBIDDEN ROOM

There are only six keys to the door, and the lock is often changed. . . . For this is a very private room. It is in the plant of one of America's greatest corporations, and behind the door to this inner sanctum part of the future is being made.

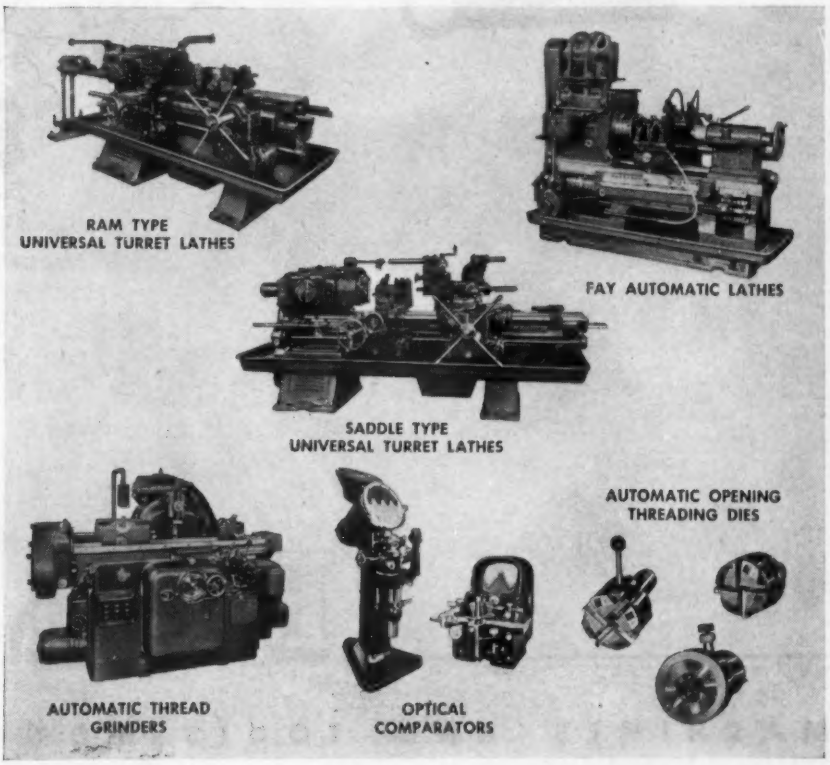
There are literally hundreds of "forbidden rooms" in America today, where the plans, the designs, the mock-ups and models are being made for countless new products and machines — from giant electrical power plants, still in the experimental stage, to table-model television sets, now a solid post-war certainty.

Few outsiders ever enter this inner circle . . . but one of these is the machine tool engineer.

For equally as important today as any brilliant new design is the *cost of manufacture* — and it is here that the machine tool engineer comes in. Leading manufacturing executives know that this factor of cost is going to be more important, in the fast competition of the post-war period, than ever before in history.

It is because of this that Jones & Lamson engineers are being taken into their conferences and their confidences: helping them to plan complete production line set-ups for the day this war ends.

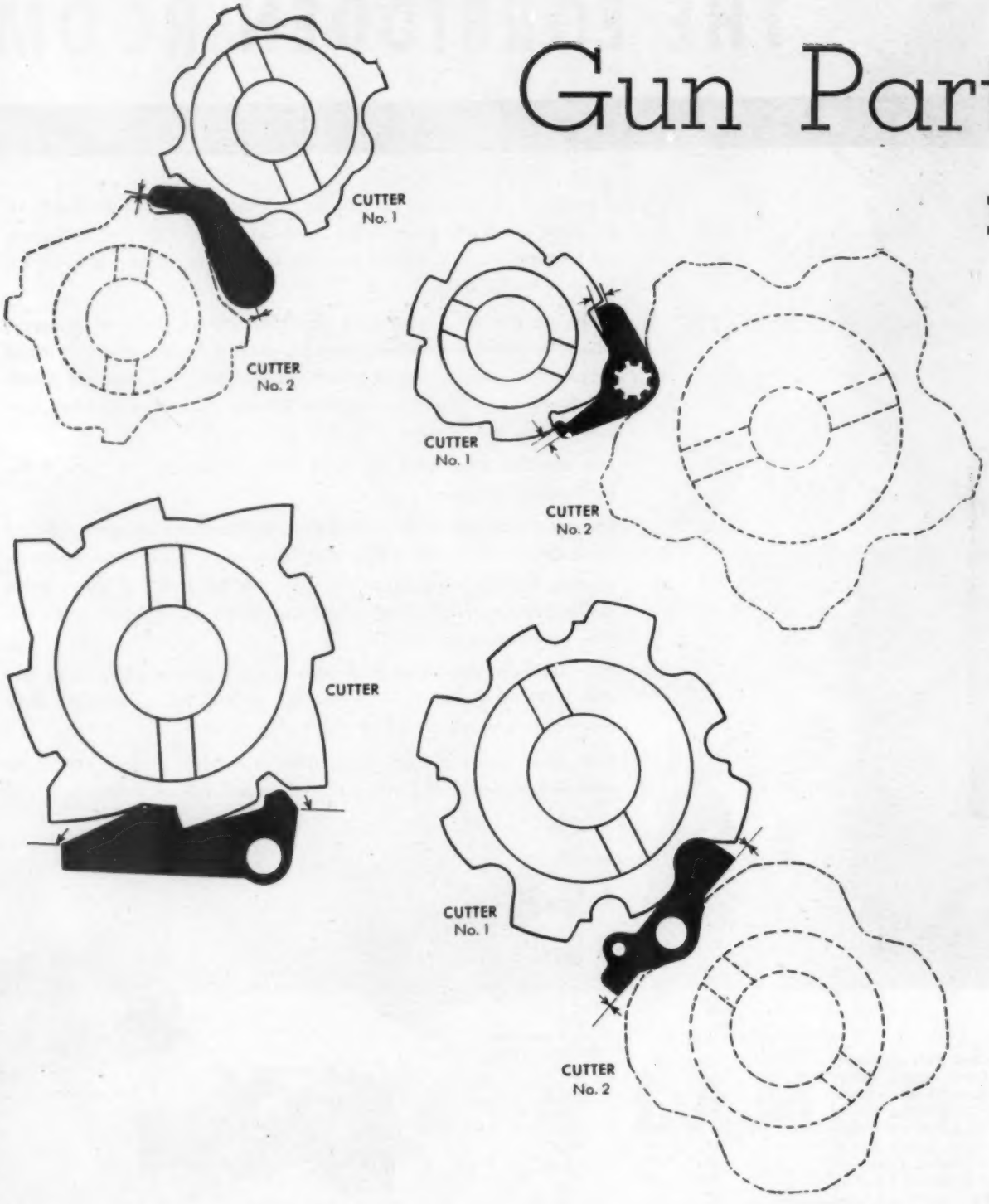
Even more important than the machine tools your company uses is the machine tool engineering that goes with the use of those tools!



Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

PROFIT-PRODUCING
MACHINE TOOLS

Gun Parts



FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTI

MACHINED

SIMPLE OPERATIONS

ON THE FELLOWS GEAR SHAPER . . .

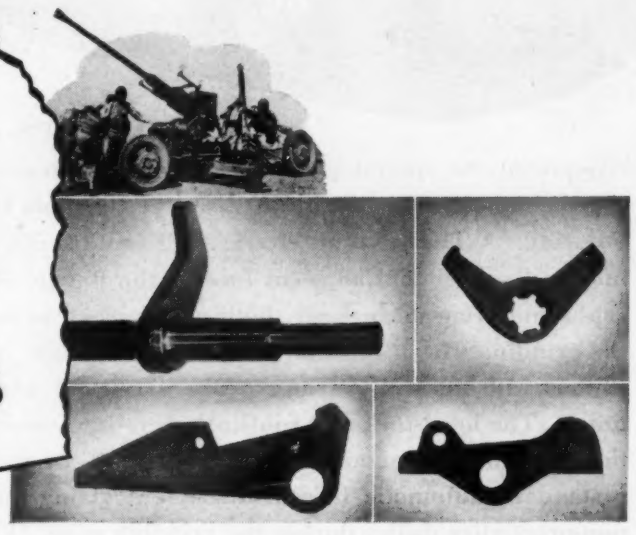
Production men who are acquainted with the generating method turn to the Gear Shaper when they have irregular profiles to machine in large quantities. The Gear Shaper method assures not only greater production, but also higher accuracy, finer finish and lower costs.

The Gear Shaper can be arranged with a magazine-type of work-holding fixture, so that a number of parts can be machined at one time, and the cutter and fixture are so designed that cutting is practically continuous — loading and unloading being accomplished without stopping the machine. Naturally production is high, and due to the inherent advantages of the generating principle and accuracy of the Gear Shaper cutter, exact duplication of parts is assured at the lowest possible cost.

Similar practical examples of irregular contour generating are illustrated in our general catalog, "The Fellows Method", for your copy, write: The Fellows Gear Shaper Company, Springfield, Vermont — or 616 Fisher Bldg., Detroit, or 640 West Town Office Bldg., Chicago.

WAR PRODUCTION BULLETIN

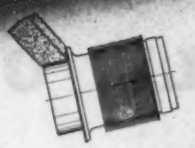
ANTI-AIRCRAFT GUN output has been speeded-up by machining irregular-shaped pawls, etc. with FELLOWS CUTTERS



Method

. . . . FROM BLANK TO FINISHED GEAR

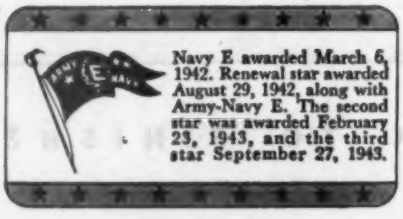
GRINDING SPECIAL JOBS ON A •



With wheel at an angle, an equally fine finish is produced on both the diameter and adjacent face of the flange.

A close-up of a CINCINNATI 10″ Plain Hydraulic Grinding Machine tailored to suit the job . . . wheelhead set at a 30° angle; headstock and footstock interchanged; automatic infeed attachment included.

IT'S not always necessary to buy special equipment for special jobs. The two large illustrations are a good example of what may be accomplished on a CINCINNATI 10″ Plain Hydraulic Grinder with a minimum of tailoring. ¶ The part, an aircraft cylinder barrel, requires accurately ground surfaces on the diameter and adjacent face of the flange. To do these operations in the most rapid and accurate manner, both are finished in one setting of the work. This requires the grinding wheelhead unit to be set at an angle, so that the wheel will make a line contact with the flange (same as the diameter) and thereby produce the best possible finish. The headstock and footstock were interchanged for the purpose of directing the thrust of the cut against the headstock unit. In addition, the machine is equipped with a standard automatic infeed attachment giving the operator a chance to complete his non-productive duties during the grinding cycle. This set-up assures exceptionally close accuracy and rapid production. ¶ Our engineers will be glad to tell you how the CINCINNATI 10″ Plain Hydraulic Grinder may be applied to your centertype work.



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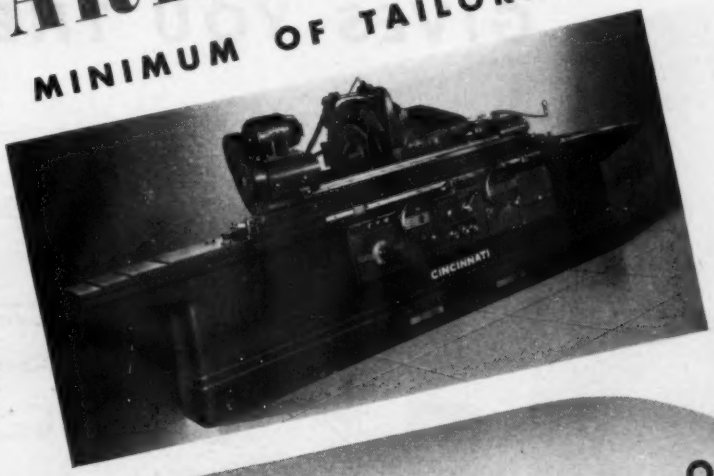
CINCINNATI G

CINCI

CENTER TYPE GRINDING MACHINE CENTE

STANDARD MACHINE

WITH A MINIMUM OF TAILORING



Right: CINCINNATI 10" Plain Hydraulic Grinder. For complete details and engineering specifications, write for catalog G-490-1.

Another illustration of the same machine shown on the opposite page. The big advantage lies in the fact that the machine is a standard design. And since all units of this machine are standard, complete information may be found in the regular specification catalog No. G-490-1.

CINCINNATI

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN

GIVES YOU THESE DISTINC

APPLICATIONS:

- HARDENING
- BRAZING
- SOLDERING
- ANNEALING
- MELTING
- AND OTHER SELECTIVE HEATING APPLICATIONS

HIGH FREQUENCY
INDUCTION HEATING EQUIPMENT
ADVANTAGES

UNIFORM HARDENING—Once the proper working coil and heating and quenching cycle of a particular work piece has been established, piece after piece is hardened with identical physical characteristics, as to the heat penetration and the depth of hardness.

POSITIVE RESULTS—Whether the Induct-O be used for hardening or annealing, brazing, soldering, etc., positive results will be obtained because the heating time, temperature, and depth of heat penetration is accurately and automatically controlled.

SAVES TIME—Because the heat is localized to a specific portion of a work piece, induction heating hardens or heats most metal parts in a matter of seconds as compared to hours when other methods such as furnaces, carburizing, etc., are used. Thus once the machine is set up for a particular job, the operator hardens piece after piece in a few seconds.

INCREASES OUTPUT—Because the entire heat-treating operation is automatic, practically no distortion or warping is encountered . . . scale is minimized . . . and chances of human error are eliminated. Add to this the fact that the heating operations are completed in seconds, and it is readily seen how output is increased.

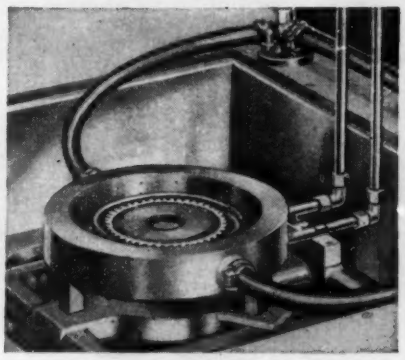
EASY TO OPERATE—To perform any hardening, annealing, brazing, or soldering operations, simply provide the proper fixture and heating coil, then determine the heating time required for the job and proceed with the operation. The average shop worker can easily learn how to operate the machine. No special skill is needed. Changing from one job to another requires only the changing of the work fixture and determining the heating cycle.

CONSERVES ALLOY STEELS—Van Norman Induction Heating Units conserve alloy steels because they enable manufacturers to surface harden parts at the points of wear, giving these sections the strength to stand up under greater stresses. Thus, ordinary carbon steels can be used in many places where more expensive alloy steels were previously used.

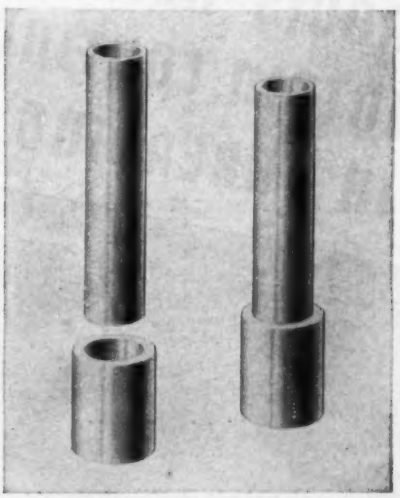
REDUCES SPOILAGE—Since warping, scale, and distortion are practically eliminated, rejects through spoilage are minimized, and part after part can be turned out exactly alike.

UNLIMITED APPLICATIONS—The Van Norman Induct-O has practically no limit to its applications for hardening, annealing, forging, brazing, soldering, melting, etc., within their work capacities. The only requirement is the use of a proper work holding fixture and heating coil. Shown at left is the 32KW Induct-O with quench table, work-holding fixture and coil for a typical hardening application.

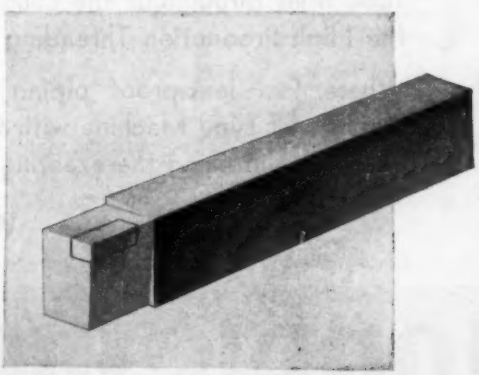
The new Van Norman Induct-O Catalog contains valuable information on the possibilities, advantages and applications of high frequency induction heating. Write for your copy, today.



Illustrated is a typical operation . . . surface hardening the teeth of a gear. The total operating time for surface hardening this gear is twenty seconds.



A typical soldering application performed with the Van Norman Induct-O. Irregular as well as regular parts are quickly and easily soldered.

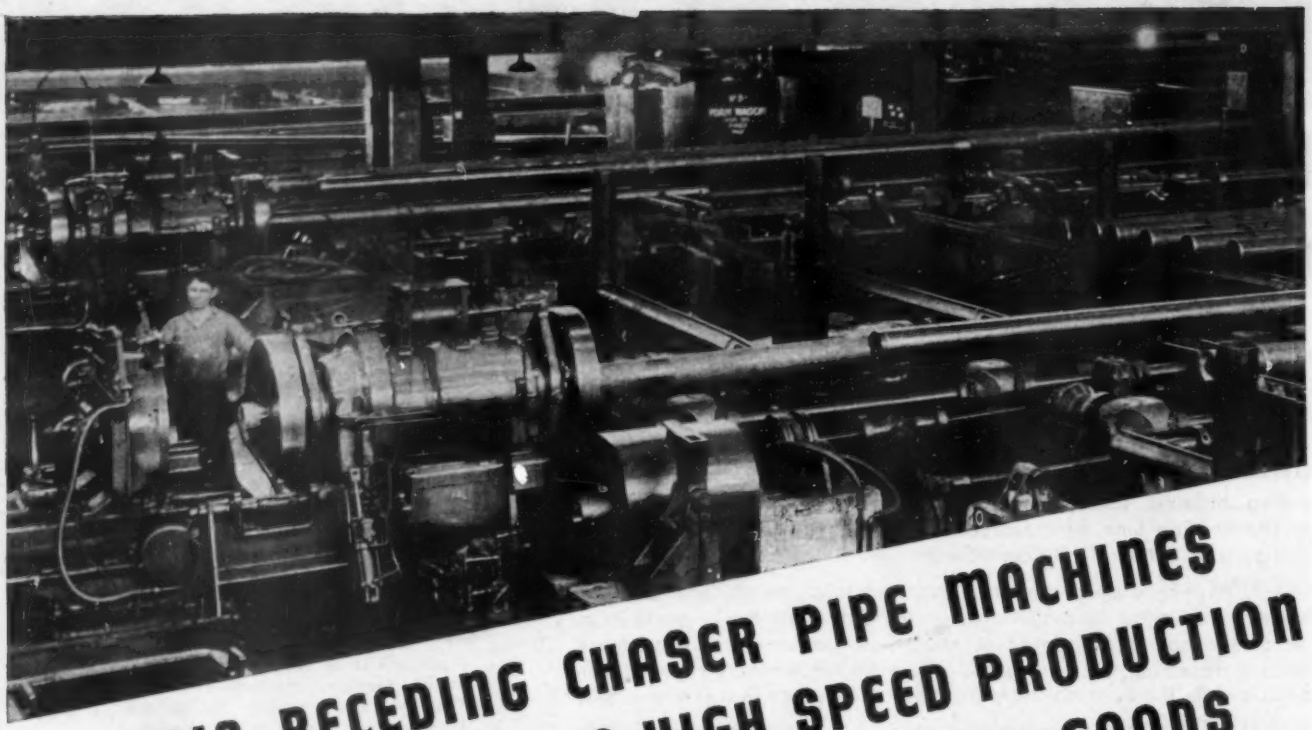


Brazing carbide tips to mild steel tool shank is quickly performed. In illustration, tip is brazed to shank in but a few seconds.

ARMY E NAVY

VAN NORMAN COMPANY
ELECTRONICS DIVISION
SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"



LANDIS RECEDING CHASER PIPE MACHINES MAINTAIN CONTINUOUS HIGH SPEED PRODUCTION IN THREADING OIL WELL TUBULAR GOODS

Tube Mills throughout the country are using Landis Receding Chaser Pipe Machines for the High Production Threading of Oil Well Casing, Tubing, and Drill Pipe.

Where fast leak-proof piping assemblies must be completed in minimum time, the Landis Mill Type Machine with the Receding Chaser Die Head has proven most dependable in maintaining the exacting accuracy of A.P.I. Tolerance Specifications.

Write for Bulletin C-77

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A

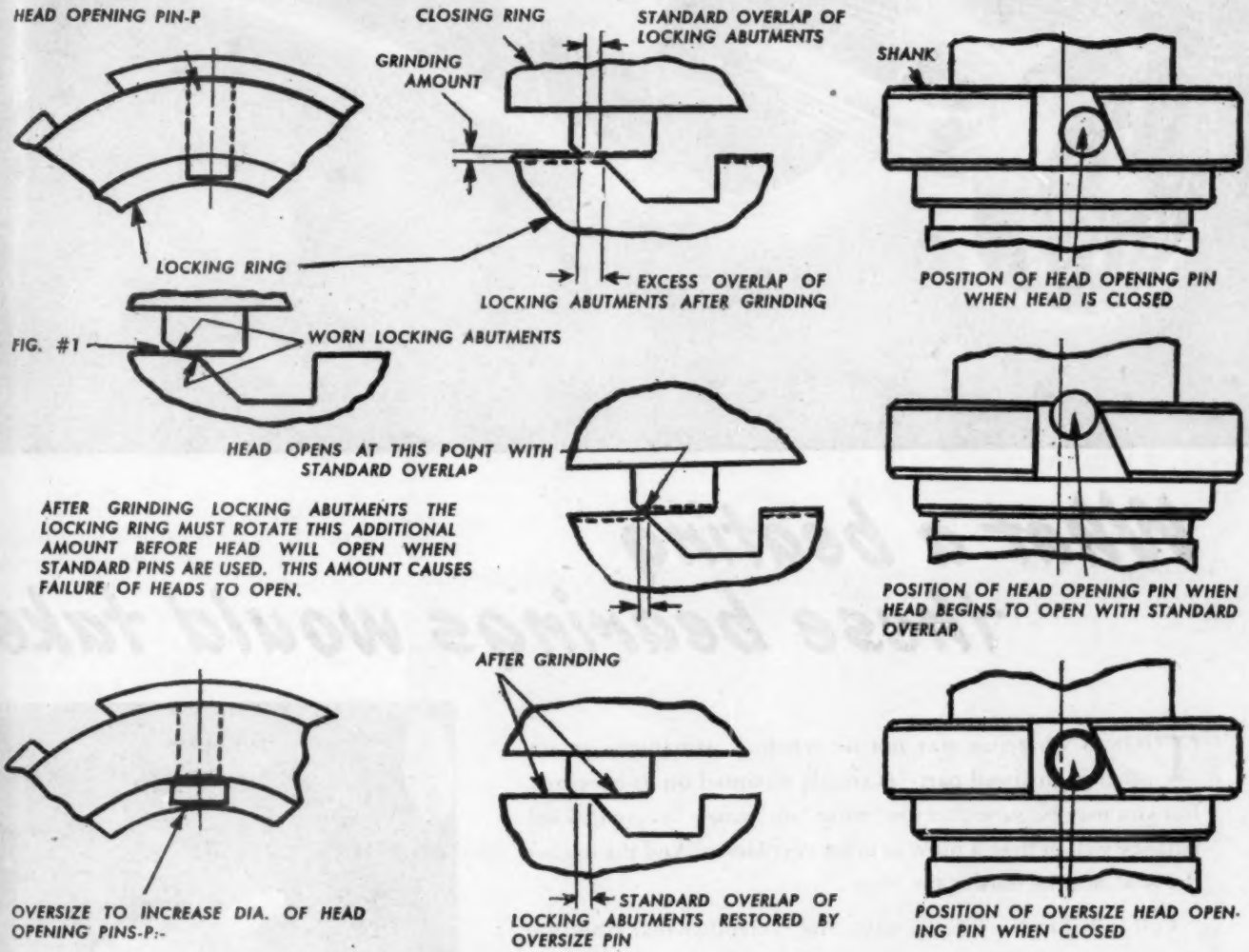
LANDIS TRADE MARK REG. U.S. PAT. OFF.

THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

Slight grinding operation completely renews the locking and opening action of LANDMATIC HARDENED and GROUND HEADS


HEAD OPENING PIN-P
CLOSING RING
STANDARD OVERLAP OF LOCKING ABUTMENTS
GRINDING AMOUNT
SHANK
LOCKING RING
EXCESS OVERLAP OF LOCKING ABUTMENTS AFTER GRINDING
POSITION OF HEAD OPENING PIN WHEN HEAD IS CLOSED
FIG. #1
WORN LOCKING ABUTMENTS
HEAD OPENS AT THIS POINT WITH STANDARD OVERLAP
AFTER GRINDING LOCKING ABUTMENTS THE LOCKING RING MUST ROTATE THIS ADDITIONAL AMOUNT BEFORE HEAD WILL OPEN WHEN STANDARD PINS ARE USED. THIS AMOUNT CAUSES FAILURE OF HEADS TO OPEN.
POSITION OF HEAD OPENING PIN WHEN HEAD BEGINS TO OPEN WITH STANDARD OVERLAP
AFTER GRINDING
OVERSIZE TO INCREASE DIA. OF HEAD OPENING PINS-P:-
STANDARD OVERLAP OF LOCKING ABUTMENTS RESTORED BY OVERSIZE PIN
POSITION OF OVERSIZE HEAD OPENING PIN WHEN CLOSED

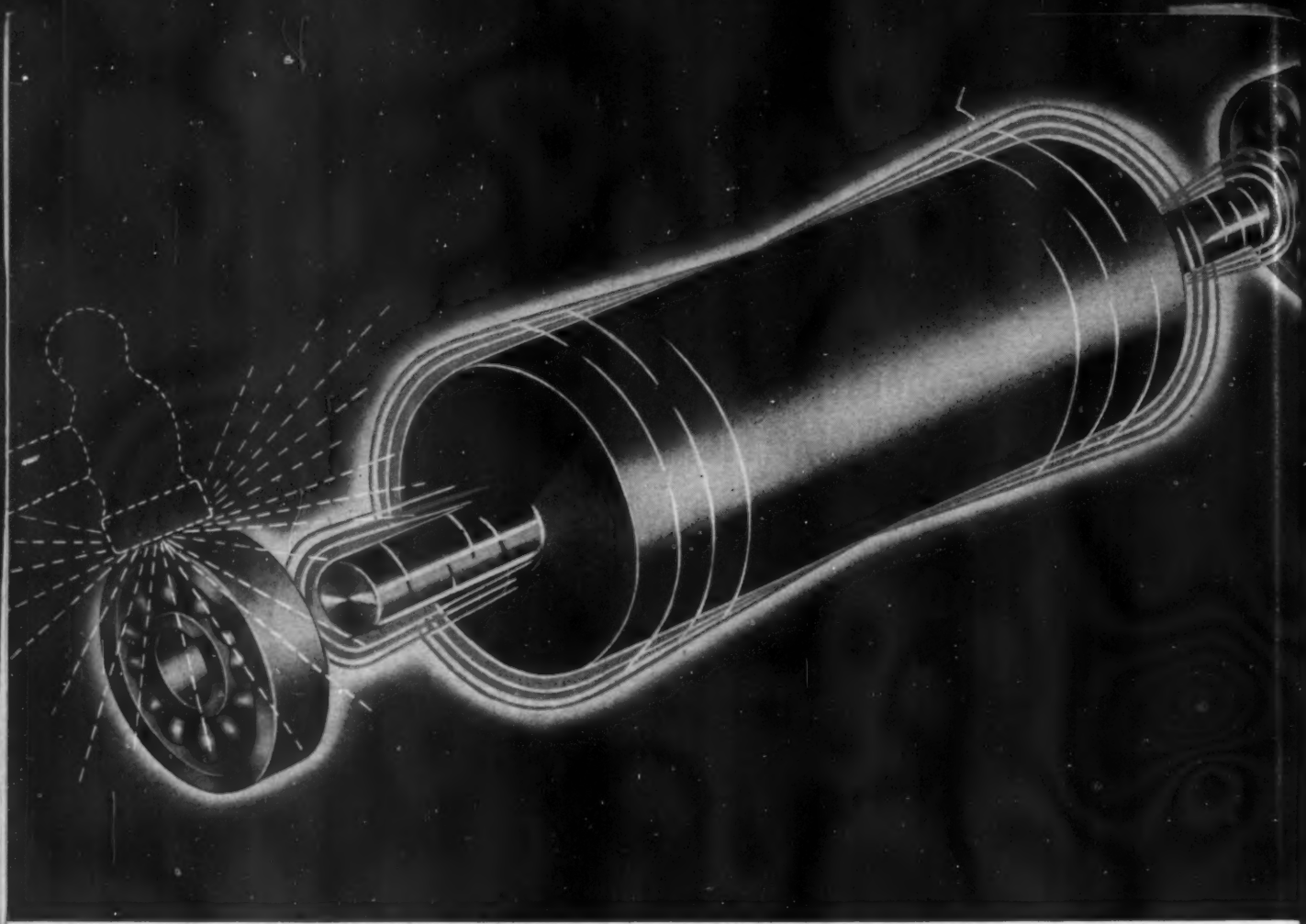
When more than .010 is ground off locking abutments, head may fail to open properly, as overlapping of abutments is increased.

To correct this, new opening pins P must be made, with an increased diameter as shown. Pins made 3/64 larger diameter than standard will correct grinding .011 off each abutment.

The ratio to increase the diameter of the opening pins is 4 to 1. For example, if .005 is removed from both abutments then add .020 to the standard diameter of the opening pins.

See Announcement on Page 27

LANDIS MACHINE COMPANY, WAYNESBORO, PENNA, U.S.A.



What a beating these bearings would take!

THIS is what you may not *see* when an armature—or any other high speed part—is snugly mounted on its bearings. But you may be sure that the "whip" or "throw" caused by unbalance will deliver a blow at every revolution. And the higher the R.P.M., the harder the blow.

Call it "vibration" if you wish. But remember that vibration means punishment for any high speed assembly . . . punishment that strains, wears, and shortens the life of vital parts.

To eliminate this unbalance and vibration is the job which Gisholt Dynetric Balancing Machines accomplish more quickly, more easily, and more accurately than ever before. If your product can be improved by it, write for full information.

DYNETRIC BALANCING first enables you to *locate* the point of unbalance; then *measure* it for accurate correction. Electronic tubes amplify unbalance vibration as much as 1,600,000 times.

GISHOLT MACHINE COMPANY

1201 East Washington Street • Madison, Wisconsin

Look Ahead . . . Keep Ahead . . .
With Gisholt Improvements

What's Ahead?

No. 1 in a Series

Experts are working experimentally on a universal sign language for use during the period of reconstruction following the war. It has a vocabulary of about two thousand words and can be learned in about a month.

★

Reshingling of homes may be entirely eliminated after the war. With plentiful cheap aluminum as one of the benefits of the great disaster, we expect to have aluminum shingles, and the glass industry has already developed a lifetime glass shingle.

★

Radio waves are now being used to spread the layer of tin on tin cans and thinner than it was before the war.

★

The Diesel engine is close to its long-sought ideal of one pound per horse power. This may indicate that this thrifty engine, already scheduled to power our postwar trucks, may also be suitable for our pleasure cars.

★

Little by little new ideas combine to make flying more practical for tomorrow's civilians. One of these is a simple device for night landing which uses two lamps aimed toward the ground. The beams of these lamps are focused so that they come together to form a single spot of light on the ground when the plane is at exactly the right height for "setting down."

★

A new fuse for artillery shells is said to be so sensitive that it will explode the shell on hitting a raindrop.

★

The use of aluminum can reduce the weight of a freight car from forty-five thousand to fifteen thousand pounds with a corresponding increase in capacity.

★

Factories have been built with heating pipes permanently laid in the solid concrete floor. The method seems to be practical, economical and suitable for the heating of our homes.

★

In spite of the war, the Dutch have been able to produce a new hybrid plant, a cross between the carrot and the beet called the "wobbie".

To supply a Pacific coast shipyard with 152′ one-piece keels for Navy minesweepers, giant trailers are being used that haul 60 tons of Douglas fir logs of this length.

★

Experiments are being made with artificial teeth held in place by magnets.

★

It is expected that vast amounts of magnesium will be used after the war, and it is encouraging to know that our supply is large and beyond the reach of the enemy. Although there is only fourteen one-hundredths of one percent of magnesium in sea water, there are four and one-half million tons in a cubic mile.

★

Fifty thousand patents, formerly the legal property of our enemies, are now available to American industry.

★

The electron microscope will now measure particles as small as one-millionth of an inch.

★

The Civil Aeronautics Administration expects us to have half a million private and commercial airplanes by 1950.

★

A new synthetic textile filament, the finest yet produced by man or nature, is so small that it takes twenty thousand miles of it to weigh a pound.

Automobile tires are now being checked for invisible flaws by passing high-frequency sound waves through them

★

Plastic bearings for machinery will require no lubricants for moderate speeds and loads, and in many cases water has been found to give sufficient lubrication for even high speeds and heavy loads.

★

"Facsimile", a method of printing a miniature newspaper by radio in individual homes, was tried experimentally before the war began. By this method the printing is done during the night and a newspaper, complete with illustrations and advertising, is ready at breakfast time.

★

There is a very good chance that we may have television in full color and three dimensions. It may also be possible to store up television broadcasts to be re-run later.

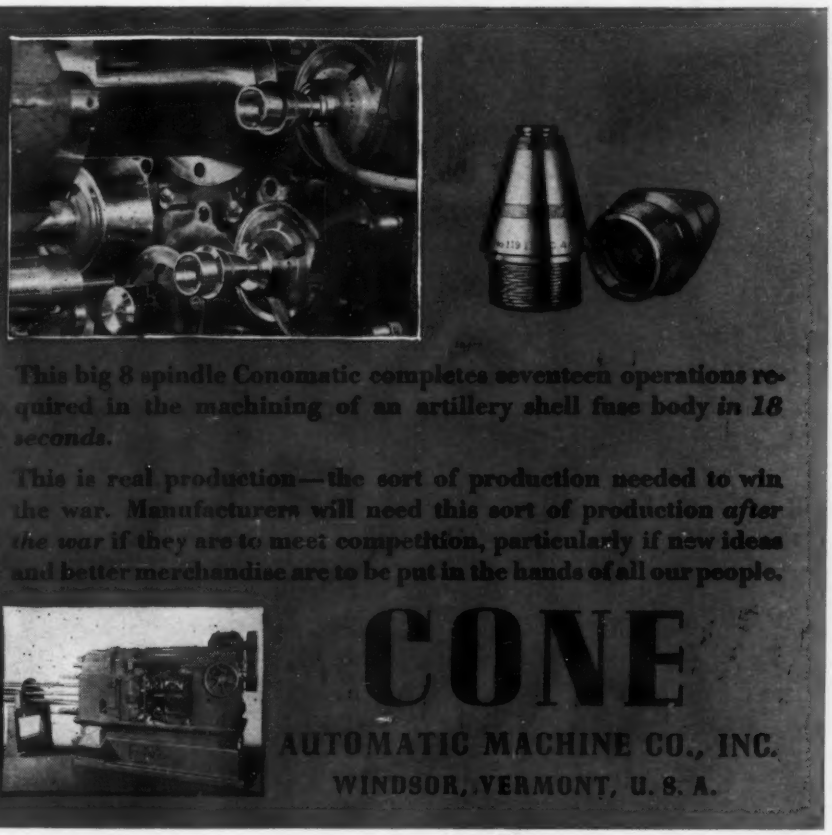
★

A micro-hardness tester is now made that can test a single microscopic grain of metal.

★

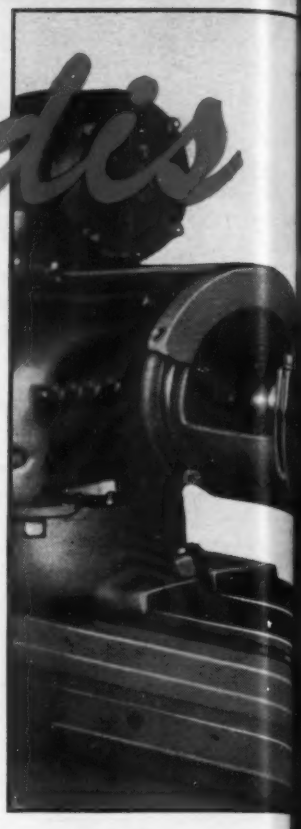
Shipwrecked sailors will soon have the benefit of a tiny searchlight no bigger than a walnut that is visible for 60 to 70 miles and good for 100 hours of use.

★


This big 8 spindle Conomatic completes seventeen operations required in the machining of an artillery shell fuse body *in 18 seconds.*
This is real production—the sort of production needed to win the war. Manufacturers will need this sort of production *after the war* if they are to meet competition, particularly if new ideas and better merchandise are to be put in the hands of all our people.
CONE
AUTOMATIC MACHINE CO., INC.
WINDSOR, VERMONT, U. S. A.

DETROIT PUBLIC LIBRARY

Those Landis



Long ago Landis Universals took their place in the production line. Here their versatility, plus their productiveness, has broadened their use to a surprising degree.

The ease with which a variety of internal fixtures may be applied has readily adapted these machines to unusual internal grinding operations. Special work heads and holding fixtures have enabled them to handle odd shaped parts. And finally, the sturdy swiveling headstock has made it a simple matter for them to perform a variety of face grinding operations.

These typical set-ups are illustrated to the right:

J-190. Grinding the bore in the end of an airplane crankshaft on an 18" x 72" Landis Universal. One end of the work is held in a pot chuck while the other end is supported by a center rest. There are three separate grinding operations—the taper portion of the bore, the straight portion of the bore and the radiused counterbore.

J-193. Radius grinding an airplane engine oil seal ring on a Landis 14" x 36" Universal. The work is placed in a holding fixture which is clamped in a finger type chuck. The grinding wheel is formed to a suitable radius by a radial wheel dresser and the work head is oscillated by hand during grinding.

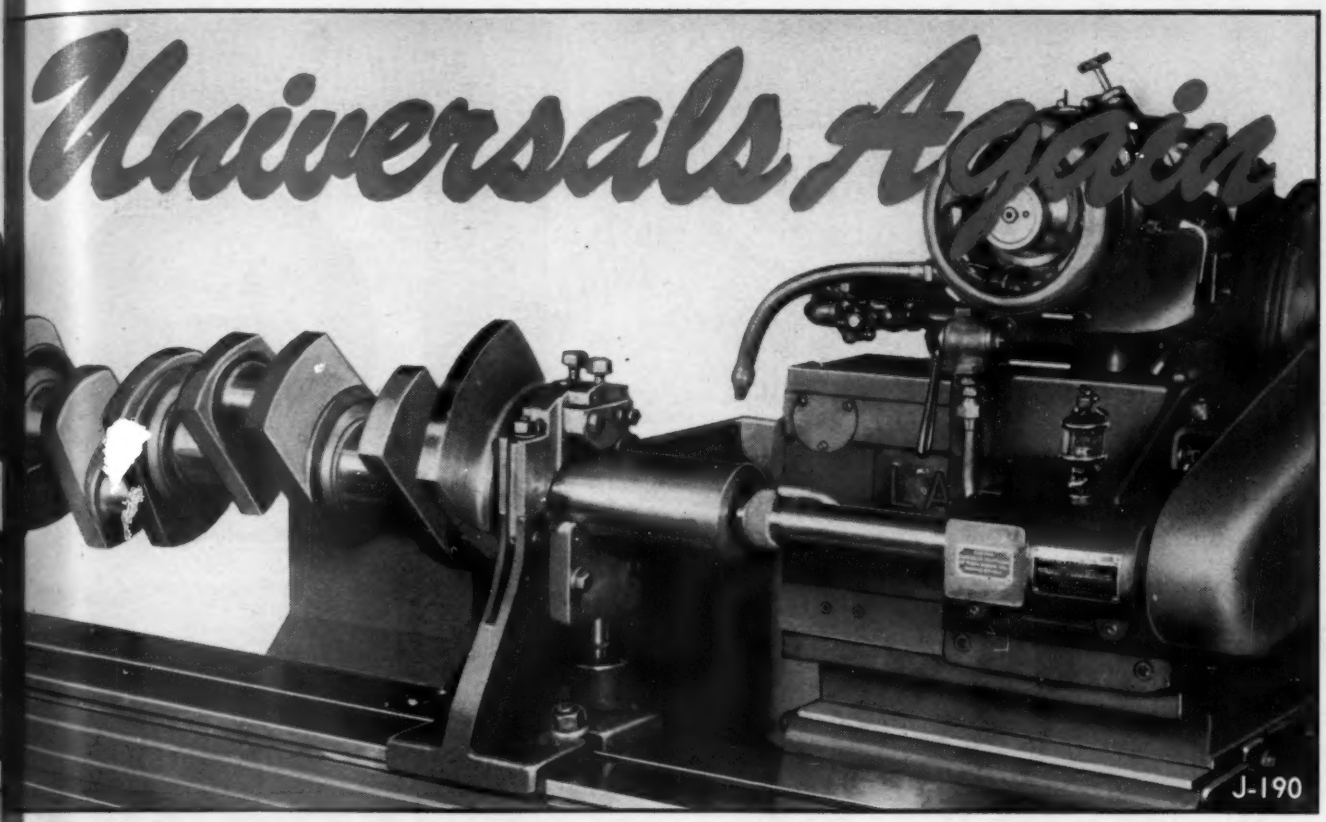
J-192. A raised Landis Universal (25" x 72") equipped with a 36" diameter face plate. The standard headstock is swiveled 90° so that this face plate may be swung in the water channel and a variety of parts are attached thereto for face grinding.

Landis Type C Hydraulic Universals are available in sizes ranging from 10" x 24" to 18" x 72". As indicated by the examples just given, extra equipment and raised swings further increase the variety of work that may be handled.

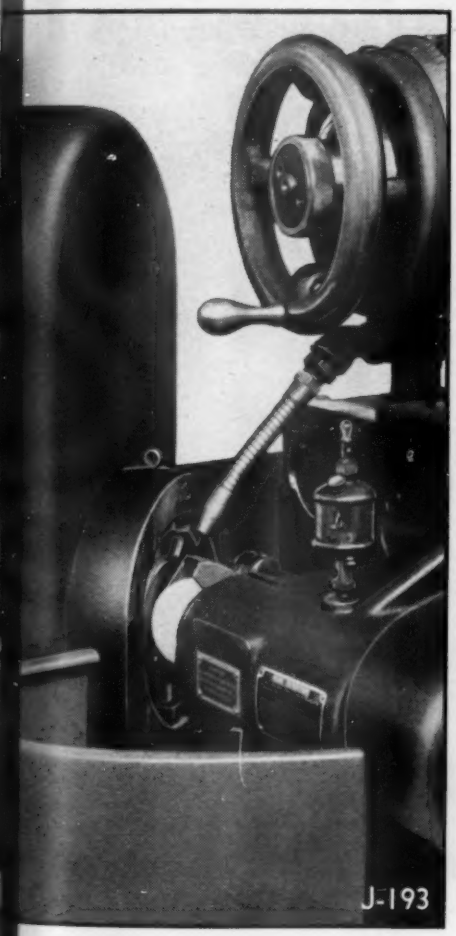
Never will the versatility of this equipment stand its users in better stead than when coming months bring the necessity to convert from the manufacture of one product to another. 424

LANDIS TOOL CO.
WAYNESBORO—PENNA.

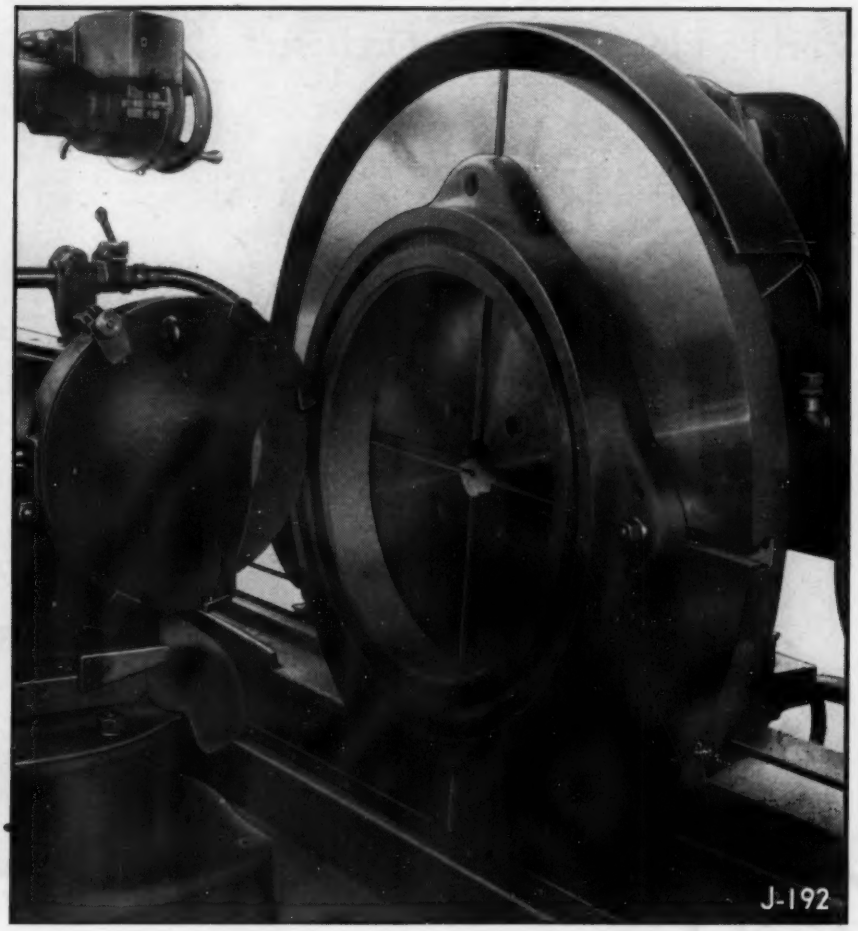
Universals Again



J-190



J-193



J-192

Unusual Performance as Usual

To You

the men of American Science
and Industry working to
further American Good Living—

WE DEDICATE

our Radio Sponsorship of the
World's Finest Music by the
World's Finest Concert Orchestra...

THE BOSTON SYMPHONY

Every Saturday, at 8:30 p m (E.W.T.)
over 170 Stations of the Blue Network,
from New England to California.

Serge Koussevitzky, Conductor

ENGINEERING THAT AIDS ALL INDUSTRY
HELPS FURTHER AMERICAN GOOD LIVING

Allis-Chalmers invites Every Reader of this Magazine to tune in next Saturday and every Saturday thereafter

MUSIC — sister to every science and industry furthering Good Living — is Allis-Chalmers' choice of radio entertainment for America.

In the words of Serge Koussevitzky, world-famous conductor of the Boston Symphony itself: "Today American audiences show not only their love and admiration of music, but also a deep understanding of the necessity and importance of musical art in the progress of humanity."

Americans also enjoy the highest standard of living of any people on earth — because they are the mightiest industrial nation on earth.

That is why we respectfully dedicate to *you*, the Men of American Industry, our radio sponsorship of the Boston Symphony.

Today over 1600 Allis-Chalmers products are helping America to the earliest possible Victory — *after the war*, the same engineering will mean Good Living, the American Way. ALLIS-CHALMERS, MILWAUKEE, WIS.

A 1686

ALLIS-CHALMERS

FOR THAT

Final Precision Grind...

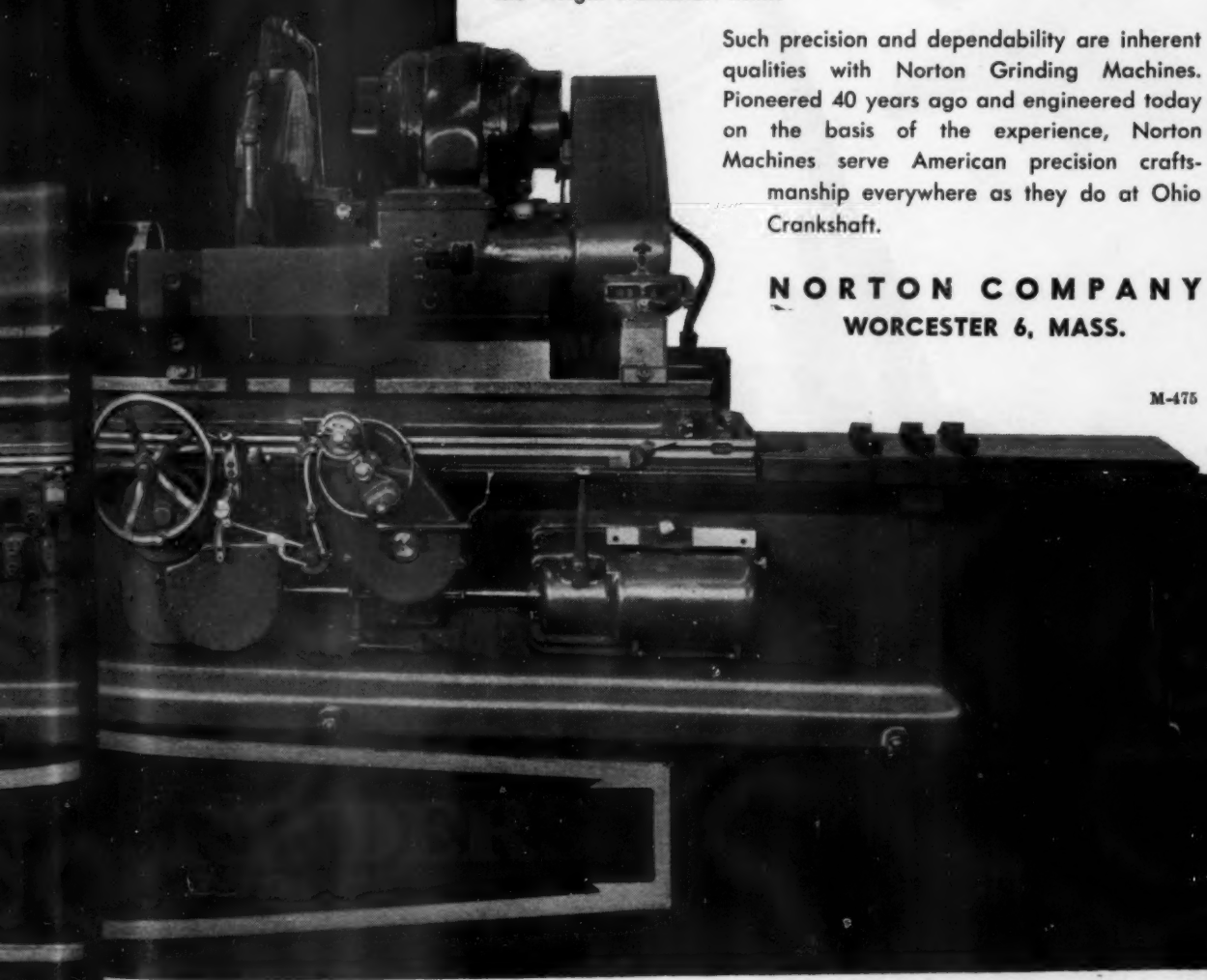
GRINDERGRAM

The wheel spindle may be termed the "heart" of a grinding machine. When something's wrong with a man's heart, or a machine's, call in a specialist. Don't "monkey" with either.

OHIO CRANKSHAFT USES *the* NORTON *Heavy Duty* HI-SWING

IN the hundreds of operations which convert raw chunks of forged steel into a precision masterpiece — the crankshaft for the famous Wright 2600 airplane motor — many machine tools including other Norton cylindrical and crank grinders play their allotted part.

But for the final grind that takes off that last "tenth" — that corrects possible errors of assembly — that brings the Wright crank to its ultimate peak of perfection, The Ohio Crankshaft Company relies implicity on the Norton 26" Extra Heavy Duty Hi-Swing Grinder. For this machine, despite its bulk, has "the touch of an angel". Its versatility and finger-tip control, accuracy and ease of adjustment are based on Norton grinding experience and engineering skill and provide a precision performance which produces the accuracy of the Wright crankshaft itself.



Such precision and dependability are inherent qualities with Norton Grinding Machines. Pioneered 40 years ago and engineered today on the basis of the experience, Norton Machines serve American precision craftsmanship everywhere as they do at Ohio Crankshaft.

NORTON COMPANY
WORCESTER 6, MASS.

M-475

. . . Imagine building war

machines *without lathes!*

It couldn't be done. That's why, long before Pearl Harbor, Monarch planned to build more lathes than ever before. Our production of high-quality engine and toolroom lathes has merited four stars on our "E" Pennant, originally awarded November 11, 1941. No type of armament is produced in this country without the use of many Monarch lathes.

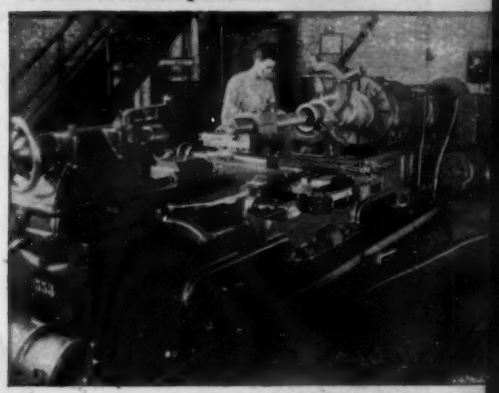
The quality of our production and our facilities have led to our selection for two important war materiel contracts involving extremely high precision work. On one, we are sole supplier; the other, we share with two other producers. These contracts will require about 50% of our capacity—but the other 50% will still be used to build lathes.

This enables us to meet current demands for high-quality, high-precision lathes. For present or post-war needs, our engineers are ready to help you solve your turning problems, effectively and economically. We invite you to consult with us.

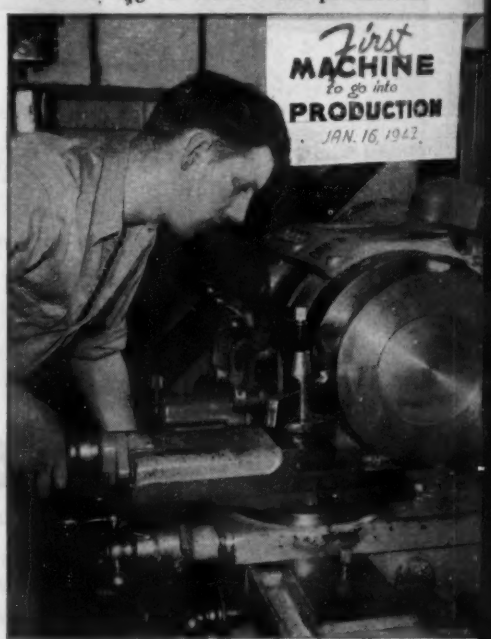
THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

MONARCH LATHES
Save Time

Turning pinions for destroyer driving mechanism, on Monarch lathe with mechanical profile attachment. Specified patterns are thus reproduced many times faster and with greater precision than with manual operation.

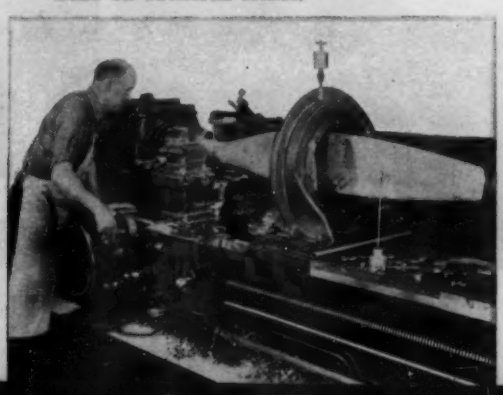


First machine tool put to work in a new $26,000,000 marine turbine plant was a Monarch lathe. This is one of many, used for tooling as well as for production.



analysis by Monarch engineers ed months of time in finishing alumi- housings and rotors for fluid drives, adapting a smaller lathe to the work, tead of waiting for a larger one.

Time and manpower were saved by using 13 tools in one setup, for taper-turning, straight-turning and grooving propeller hubs on Monarch lathes.



Amazing production figures resulted when rough-turning, facing and back-facing cylinder head flanges were done on Monarch lathes.

KENNAMETAL!

5

KM

Rockwell 90.8 A—Strongest crater resistant grade, for roughing cuts on carbon and alloy forgings, bar stock, tubing, etc., with carbon content of .30% and above.

K3H

Rockwell 91.8 A—Harder than KM but not as strong. K3H, the most crater resistant grade, is recommended for finishing or moderate cuts on carbon and alloy steels .30% carbon and above, and also for general use on soft steels containing less than .30% carbon. Used widely for milling of steels.

K4H

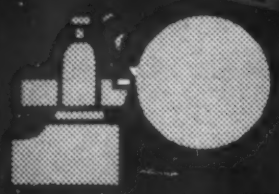
Rockwell 92.3 A—More resistant to edge wear than K3H but not as crater resitant. For precision boring and light finishing cuts on all steels. Very good for tools requiring large nose radius or where tool must dwell without cutting. Used wideiy for milling and extremely rough cutting of non-ferrous and non-metallic materials.

K2S

Rockwell 91.5 A—A strong grade better able to withstand abrasion and sand inclusions than KM, but not as crater resistant. For roughing steel castings and for very rough cuts on cast iron.

K6

Rockwell 92.1 A—A straight Tungsten Carbide grade, more abrasion resistant than K4H, but with less impact resistance. For general use on cast iron, non-ferrous and non-metallics.



SUPERIOR CEMENTED CARBIDES

LANDIS MACHINE COMPANY

has acquired Patents relating to
an entirely new and revolutionary

CENTERLESS THREAD GRINDER

from

ALFRED HERBERT, LTD.
COVENTRY · ENGLAND

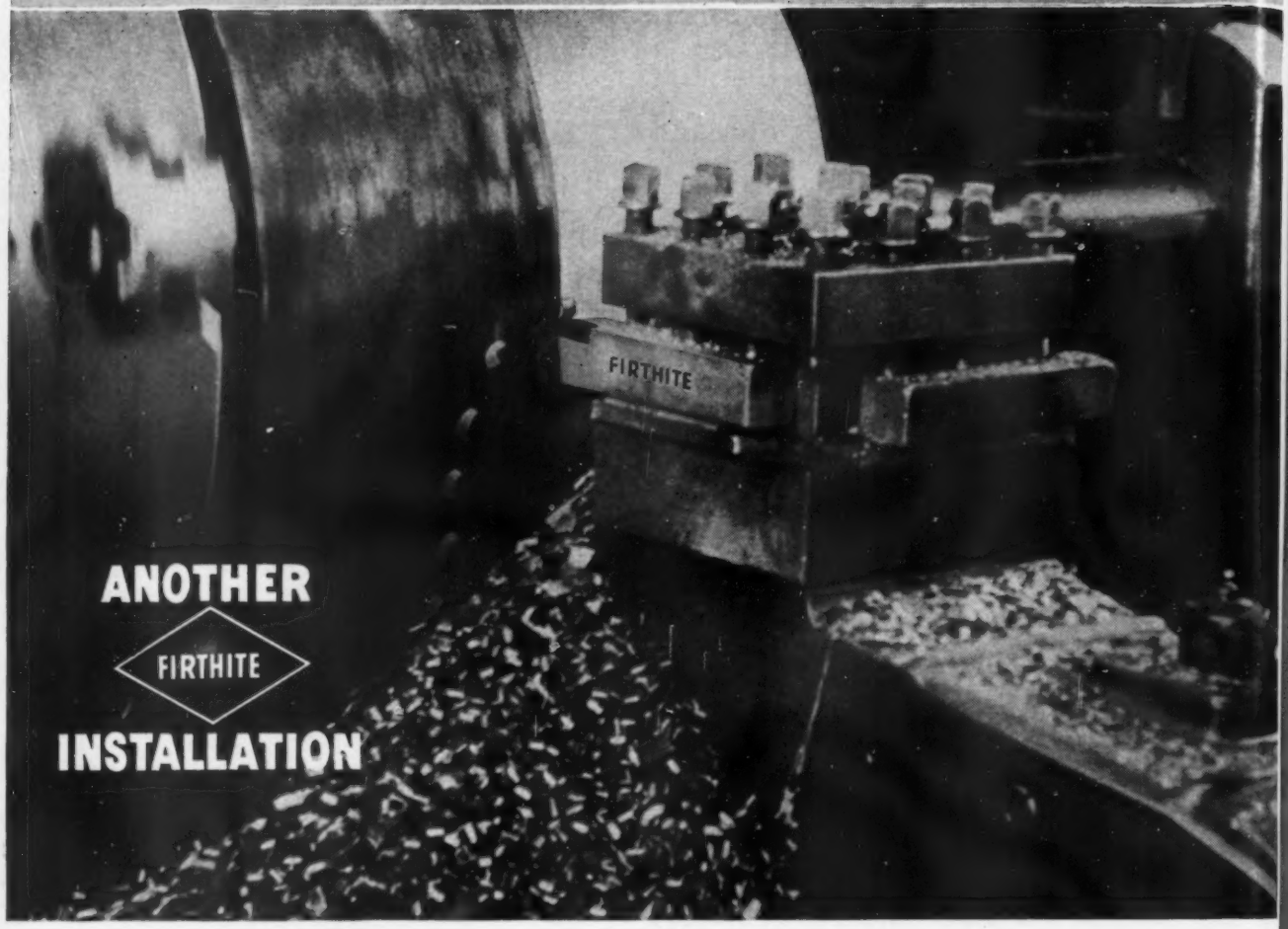
☆

This type of grinder has never been on the market, but
LANDIS MACHINE COMPANY
will be manufacturing it as soon as the war is won.

LANDIS
REG. U.S. TRADE — MARK PAT. OFF.

LANDIS MACHINE COMPANY
WAYNESBORO, PA., U. S. A.

730 POUNDS OF CHIPS PER HOUR!



Simultaneously in **boring** these castings, FIRTHITE Tools take five shocks per second on a severe, interrupted cut.

On **rough turning** this 20″-dia. gray iron casting, with only chuck support, a FIRTHITE Sintered-Carbide Cutting Tool takes a ½″ cut, 0.042″ feed at 170′ per minute—far beyond the capacity of high-speed steel tools.

FIRTHITE cuts clean and free with little pressure at high speeds . . . produces remarkably smooth and even finish. For **super** production, on **any** metal or non-metal, investigate FIRTHITE. Write today for descriptive literature.

ARMY E NAVY

Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

MAKERS OF HIGH-SPEED STEELS, TOOL AND DIE STEELS, AND SINTERED CARBIDES

METRO *Precision* GAGES

Get your copy of METRO Catalog No. 101 . . . contains complete data on all METRO Precision Tools and Gages.

PROVIDE PRODUCTIONS CHECK ON ACCURACY

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METRO TOOL AND GAGE CO.

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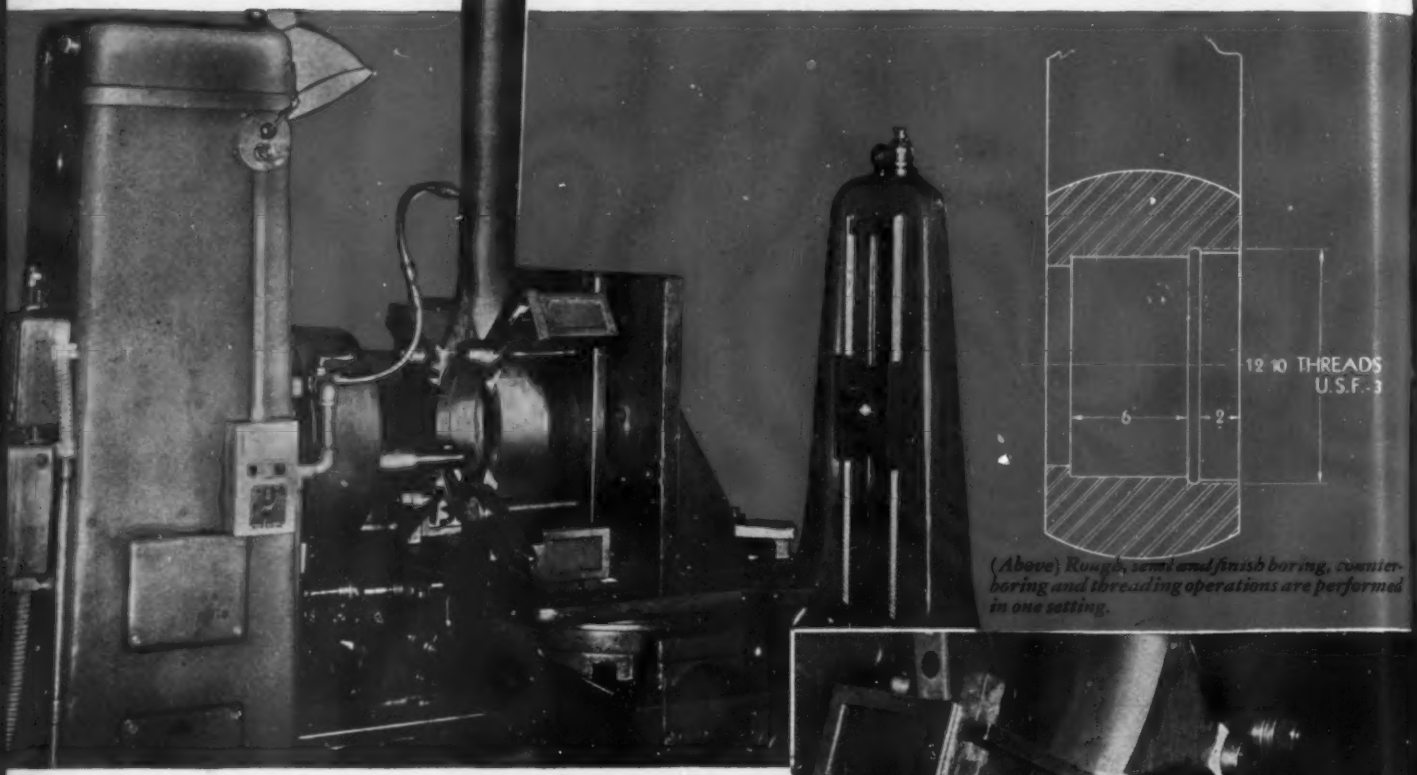
CHICAGO, 30, ILL.

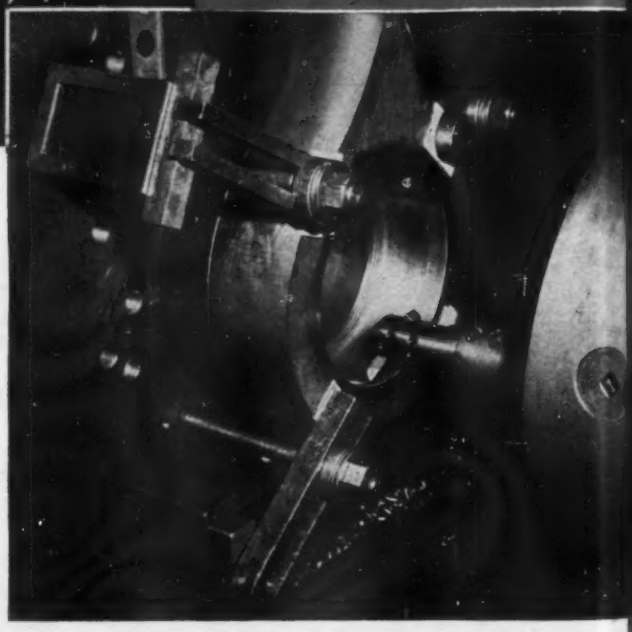
How to Bore and Thread UNUSUAL JOBS . . .

This G. & L. Horizontal Boring Mill with G. & L



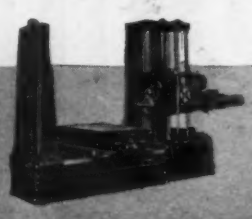
(Above) Rough, semi and finish boring, counterboring and threading operations are performed in one setting.

(Above) Showing method of mounting connecting rod on machine. Opposite end is supported by overhead hoist. Machine is G. & L. Table Type Machine.

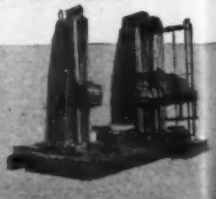


(Right) Close up of threading operation being performed by G. & L. Continuous Feed Facing and Boring Head. See opposite page for additional data on this attachment.

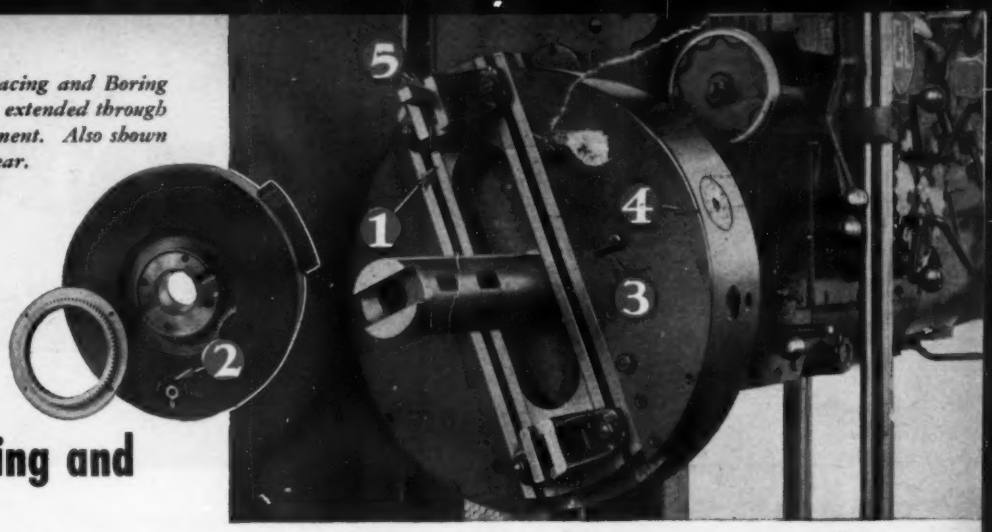
GIDDINGS & LEWIS
138 DOTY STREET



Right: G. & L. Table Type Machine.



Right: G. & L. Floor Type Machine.



(Right) The G. & L. Continuous Feed Facing and Boring Head with main spindle of the machine extended through the hardened steel bushing of the attachment. Also shown is the driving method and the flanged gear.

Continuous Feed Facing and Boring Head Does Both IN ONE SETTING!

This large connecting rod forging presents an unusual machining operation due to its size and the operations required. The operations consist of rough, semi and finish boring, counter-boring and threading a 12″ diameter bore. The thread is a V thread, approximately 2″ long, with 10 threads per inch U.S.F. Class-3 Fit. A Giddings & Lewis 17″ diameter continuous feed facing and boring head, mounted on the headstock of a G. & L. 25-RT Horizontal Boring, Drilling and Milling Machine, is used for the threading operation.

Reduce Settings and Save Time with this G. & L. Continuous Feed Facing and Boring Head

This attachment will help you do a lot of unusual jobs on your horizontal boring, drilling and milling machine. In addition to threading, it can be used for boring and facing *simultaneously.*

Mounting of the attachment requires only a few minutes of the operator's time. The five features described at the right make for easy, rapid adjustment and operation.

Because of its unusual design and construction, the continuous feed facing and boring head makes possible many operations and combinations of operations not ordinarily performed with the horizontal boring, drilling and milling machine.

A wide range of standard tools is available for use with this attachment. Special tools can be designed and built for specific applications.

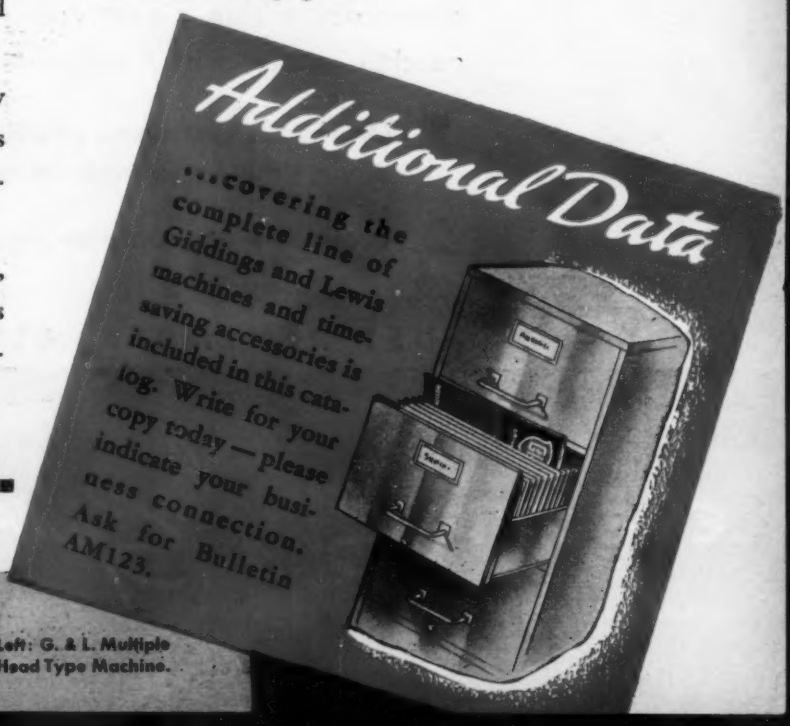
1 Tool Slide—Has six separate power feeds ranging from .009″ to .118″ per revolution of head.

2 Feed Selector—Control is provided for selection of any one of six feeds.

3 Directional Control—Lever points in direction of tool slide feed.

4 Micrometer Adjustment—Graduated to .001″ for tool slide adjustment.

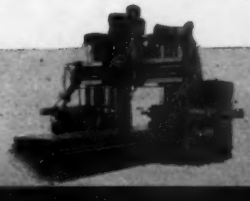
5 Two Tool Holders with ¾″ tool bits furnished as standard equipment.


Additional Data
...covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today — please indicate your business connection. Ask for Bulletin AM123.

MACHINE TOOL CO.

OND DU LAC, WIS.

Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.

CLEVELAND UNIVERSAL IN SOLVING YOUR

MANPOWER PROBLEMS of modern production, be it on munitions or "civilian goods" are more than mere questions of how many men you can get and how many hours they can work.

There are the more intricate problems of time savings on each operation on every machined part you produce. There are the problems of giving each man *the power to produce more,* both for the assembly line and for himself. These are the problems that Clevelands help to solve, not merely because they are fully automatic, but, further, the exclusive universal camming feature of Clevelands greatly reduces the time required for set-ups and adjustments.

Every operation on a Cleveland Single Spindle Automatic is controlled by standard cams. Immediate settings close to the final limits are made possible by a universal adjustment feature with which tools can be swiftly readied for the processing of any job within the wide scope of the machine . . . and when a setup is made, the Cleveland speed of production, on multiple operations, is such that savings commence within a very few pieces after the run starts. That's another reason why Clevelands have a wide reputation for . . .

1 **Maximum sustained production on *long runs,* with minimum down time for adjustments.**

2 **Profitable economy on *small lot, short run jobs.***

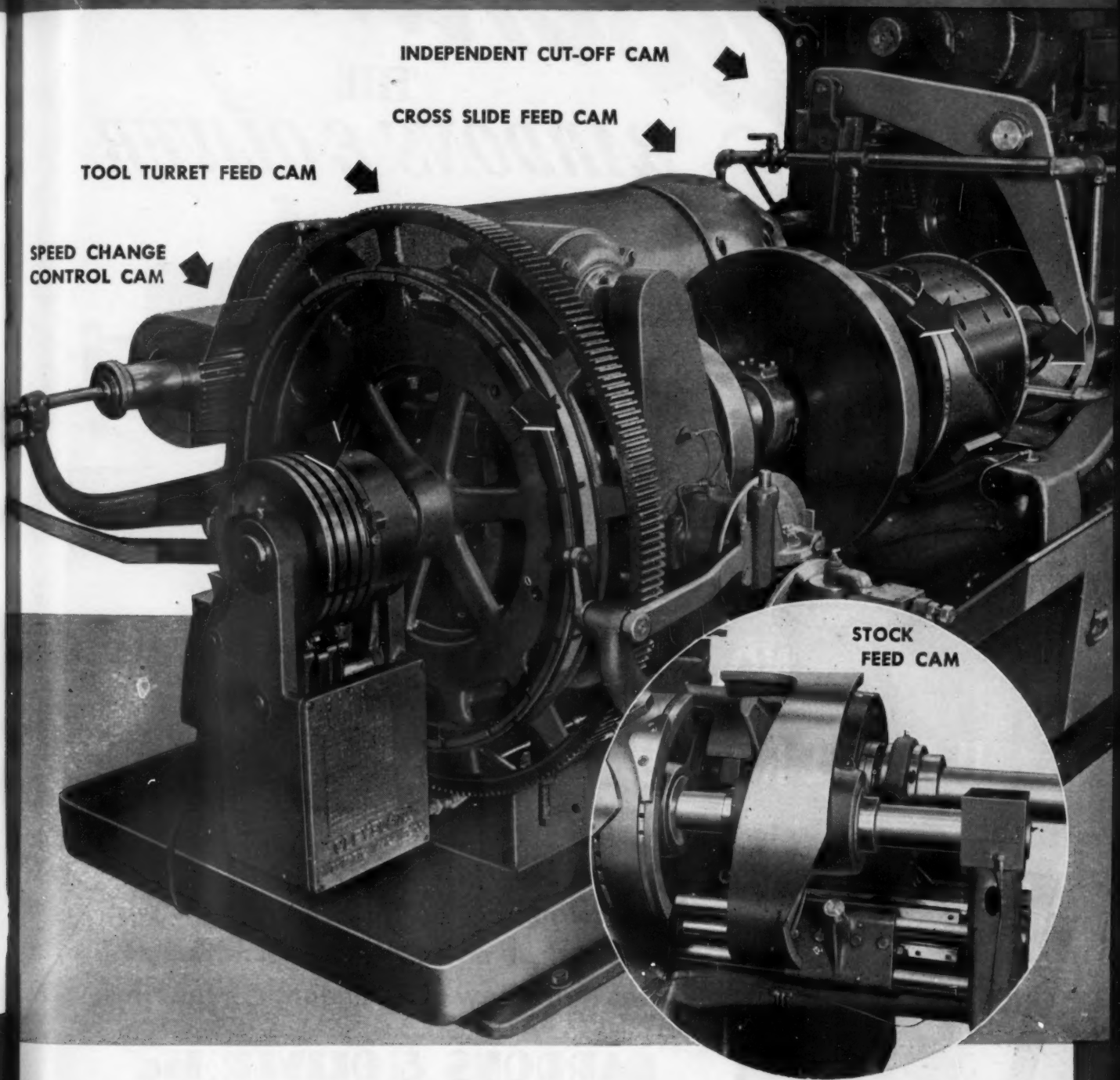
JUST REMEMBER, CLEVELANDS CUT COSTS

CLEVELAND *Single Spindle* AUTOMATICS

MODEL A—Built in 1 1/16-inch to 9 1/2-inch capacities inclusive

MODEL B—Built in 1 1/16-inch to 2 1/2-inch capacities inclusive

CAMMING HELPS MANPOWER PROBLEM



THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

SALES OFFICES

CHICAGO: 20 North Wacker Drive, Civic Opera Bldg., Room 1408
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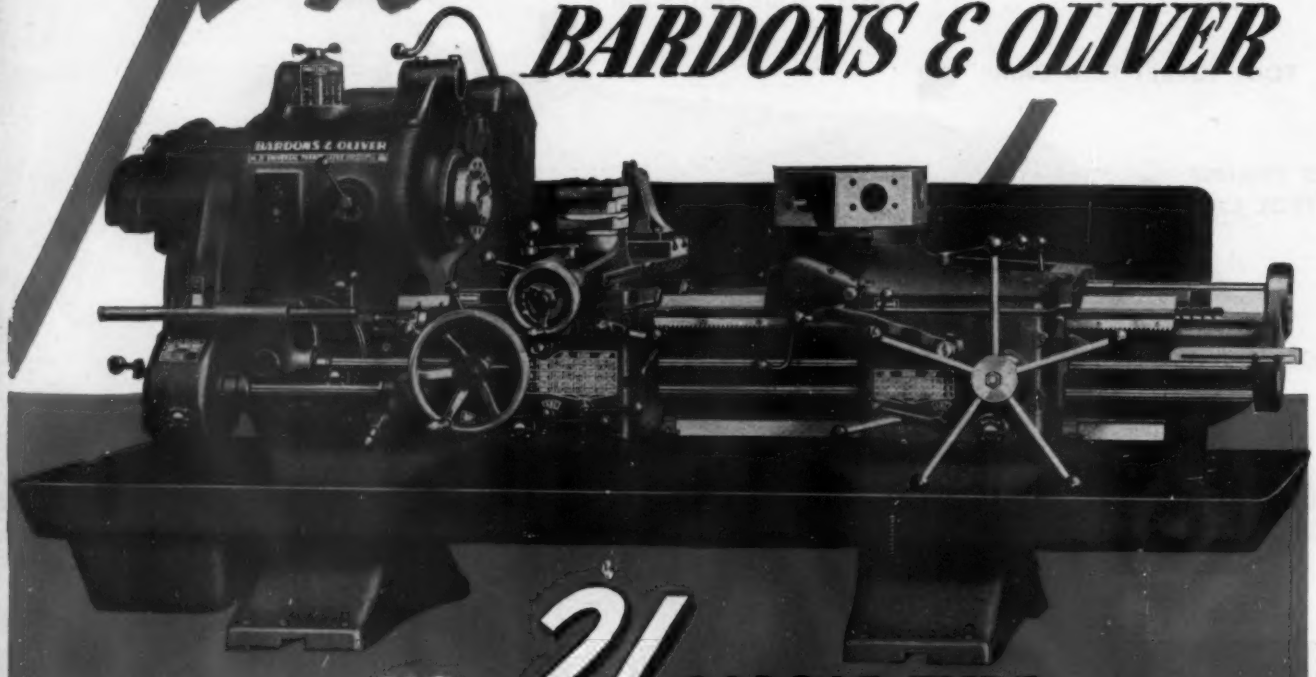
NEWARK: 902 American Insurance Bldg.
CINCINNATI: 1315 American Building

★ ★ ★

Presenting

THE BARDONS & OLIVER



NO. 21 SADDLE TYPE

UNIVERSAL TURRET LATHE

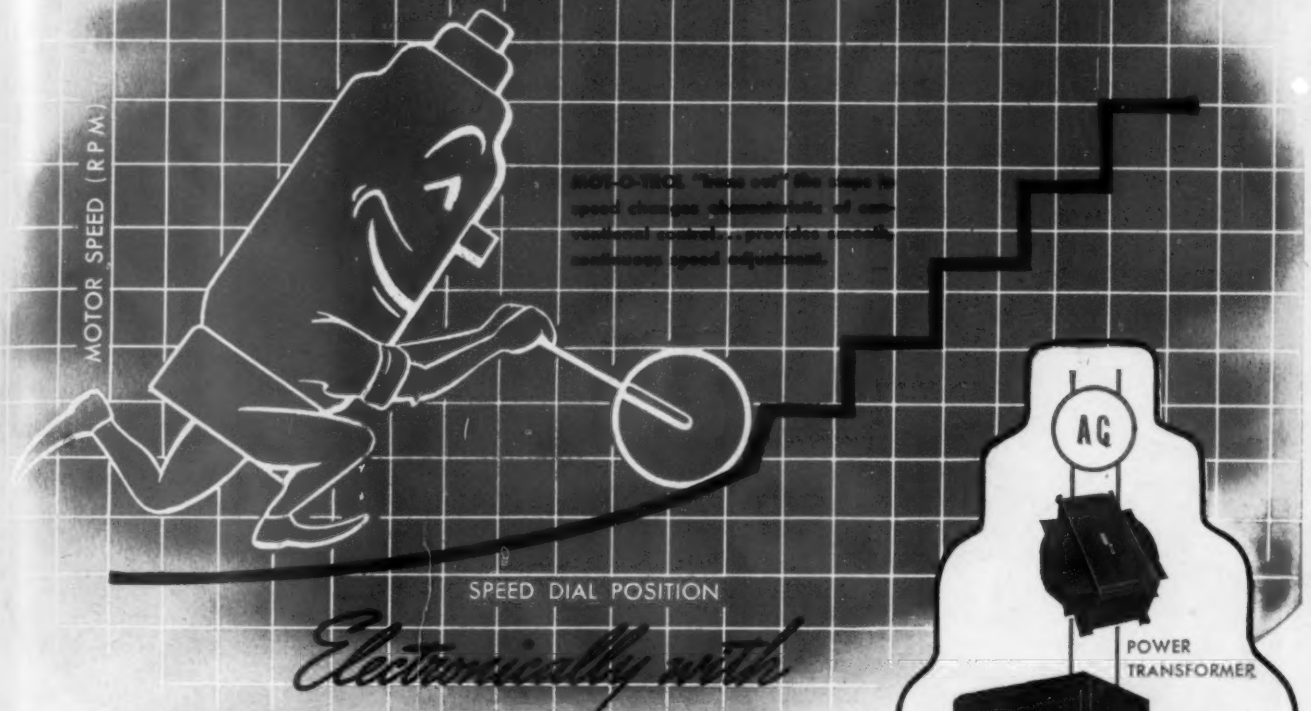
ENGINEERED to increase output of more accurate, better finished products with less physical effort, this turret lathe possesses many new and outstanding features.

BARDONS & OLIVER, INC.
1133 W. 9th STREET • CLEVELAND, OHIO

WRITE FOR A COPY OF THIS CIRCULAR

New Smooth...Stepless...Wide-Range

MOTOR SPEEDS FROM ALTERNATING CURRENT...



Electronically with

MOT-O-TROL

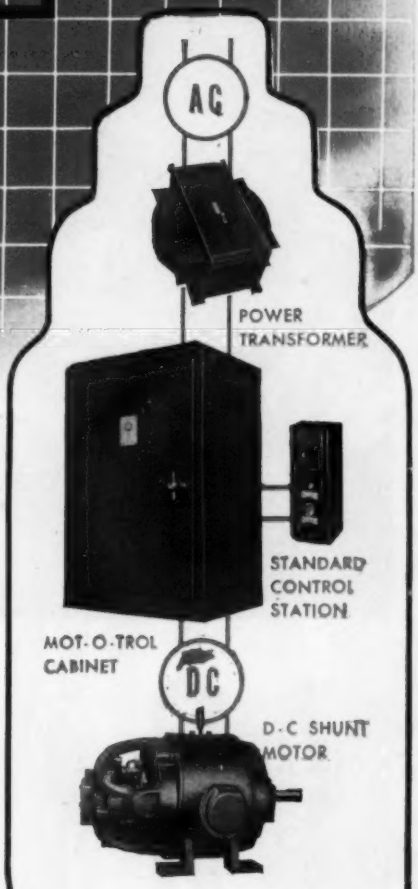
MOT-O-TROL—a new Westinghouse development—now makes possible a wide-range, stepless selection of motor speeds for machine tools . . . *with the precision of electronics.* Operating directly on alternating current, MOT-O-TROL offers important advantages even over conventional d-c motor drives (where d-c is available).

MOT-O-TROL provides finger-tip control—all drive speeds are obtainable from *one* small dial. There is only one rotating part—the driving motor. Vibration is minimized—an important factor in obtaining better surface finish with grinders.

Once speed is set, MOT-O-TROL automatically maintains pre-set motor speeds under all loads. Acceleration is smooth. Starting shock and current peaks are minimized.

Other available MOT-O-TROL functions include: dynamic braking, reversing, inching forward, inching reverse. Send for booklet B-3256 or call your Westinghouse Office for complete information. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

J-21283



HOW MOT-O-TROL WORKS

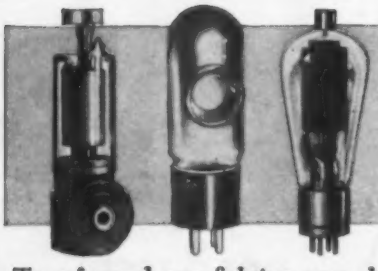
MOT-O-TROL rectifies alternating current and supplies direct current to fields and armature of a d-c drive motor. Speed control dial on control station varies these voltages through electronic rectifying tubes—thus changing motor speeds. Acceleration current also is limited electronically.

ELECTRONICS AT WORK

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Electronic **MOTOR CONTROL**



A G-E X-ray tube (1), a G-E phototube (2), a G-E thyratron tube (3), and several G-E amplifier tubes are the "eyes and brains" of this ingenious machine.

To safeguard our fighting men, hand grenades must be flawless—*every* fuse must be timed to split-second accuracy.

From the engineering laboratory of General Electric has come an automatic X-ray inspector—the first of its kind—which checks time fuses at the incredible rate of 4000 an hour . . . with the unerring accuracy no other inspection method can even approach.

A movable belt carries the fuses through the penetrating beam of a 100,000-volt G-E X-ray tube which casts its glow on a fluorescent screen. A G-E phototube, or "electric eye," inspects the glow. If constant, verdict is "O.K." If intensity changes, powder charge is inadequate for proper timing. Instantaneously, a four-way alarm is given . . . a bell rings; a red light flashes; the imperfect fuse gets a dab of red paint; a photo-electric meter chart records the "dud."

It is the purpose of G-E electronic tube engineers to aid any *manufacturer* of electronic devices in the application of tubes. Through its nation-wide distribution system, G. E. is also prepared to supply *users* of electronic devices with replacement tubes.

FREE BOOKLET ON ELECTRONIC TUBES

Send us the names of interested men in your plant. We will mail them, without charge, an illustrated, easily understood book on "How Electronic Tubes Work." Address *Electronics Department, General Electric, Schenectady, N.Y.*

• *Tune in* "The World Today" *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E* "All Girl Orchestra" *at 10 P.M. E.W.T. over NBC.*

G. E. HAS MADE MORE BASIC ELECTRONIC TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

162-C-1-8850

CADILLAC
Thread Plug
GAGES

ALL STANDARD SIZES

National Fine — National Coarse

0-80 to 1½-6

Also Pipe Plug Gages ⅛ to 1¼

WHEN you need standard Thread Plug Gages in a hurry, wire your order to Cadillac and the sizes you require will be on their way to you within 24 hours. In fact, in case of emergency, the shipment can be ready to leave from the near-by Detroit airport within an hour of the time your order is received.

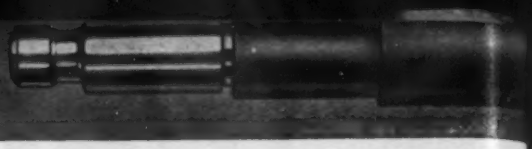
Because our entire manufacuring facilities are devoted to the production of thread plug and ring gages, with us large stocks are the rule rather than the exception. This accounts not only for the speedy service that we are able to give, but also for the high quality and percision workmanship that are the result of specialization in this particular field.

CADILLAC THREAD GAGES CADILLAC

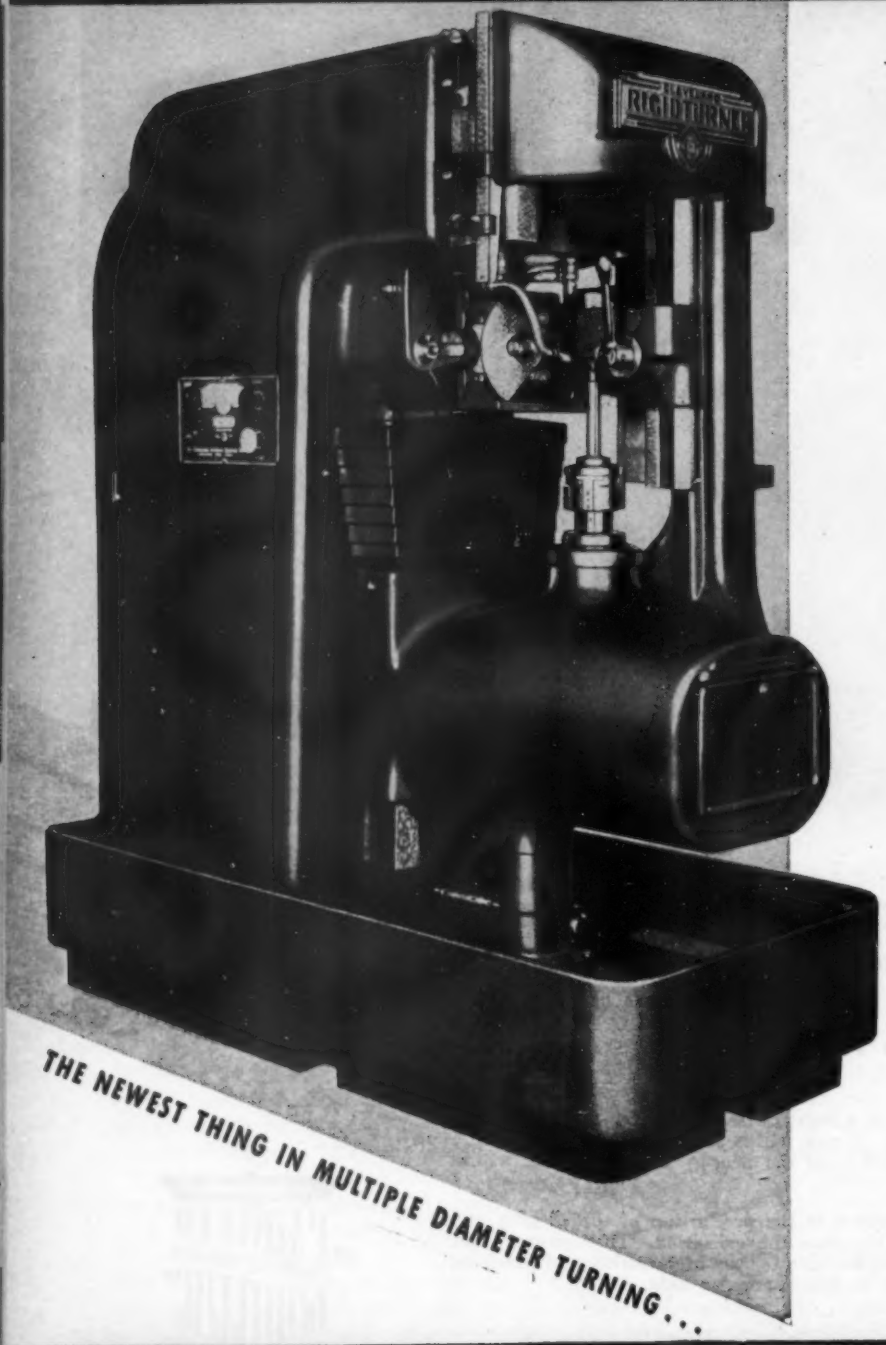
CADILLAC GAGE COMPANY, Detroit

FOR MULTIPLE DIAMETER TURNING

In small lots or high production



THE RIGIDTURNER



• When the job calls for the accurate turning of several diameters whether in small lots or quantity—put it on a Rigidturner.

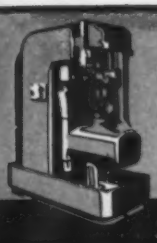
This is the newest thing in the accurate—faithful duplication of multiple diameter work.

On the Rigidturner the work advances past the cutter which is rotated in timed relation to produce various diameters.

The machine operation is automatic—all the operator has to do is load and unload the machine, press a button and the machine completes the operation.

Investigate this modern method of multiple diameter turning.

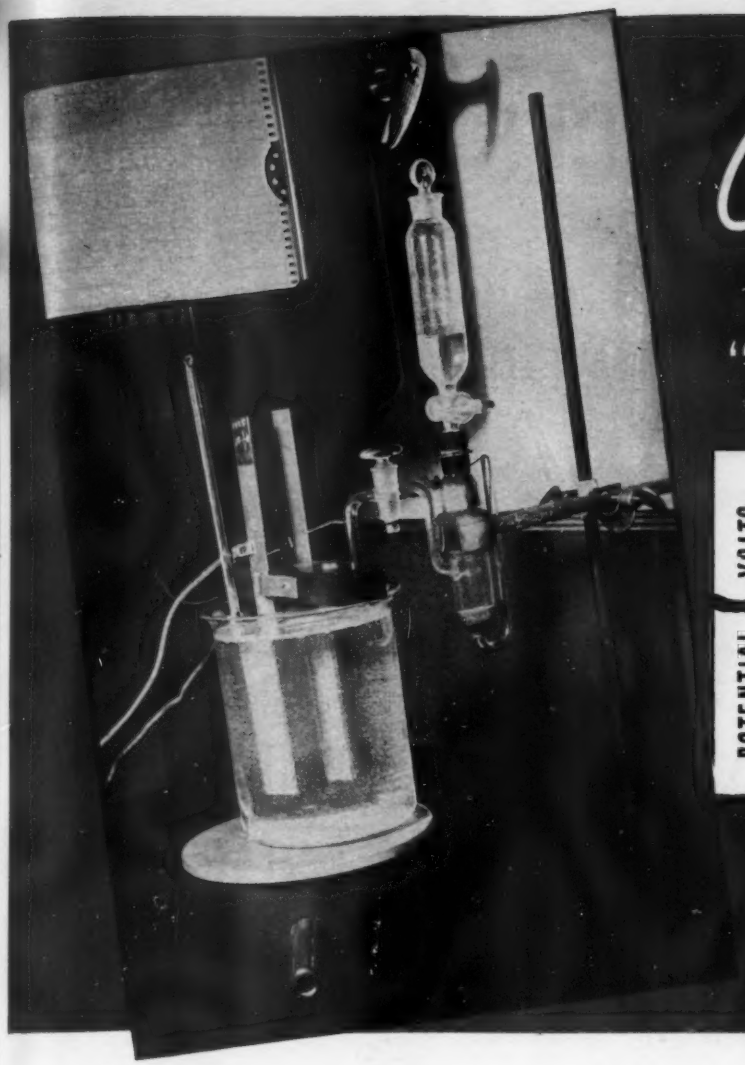
THIS BOOKLET tells how the Rigidturner works—what it does—and its many advantages on small lots or high production at amazingly low costs. Write for your copy today.



The CLEVELAND HOBBING

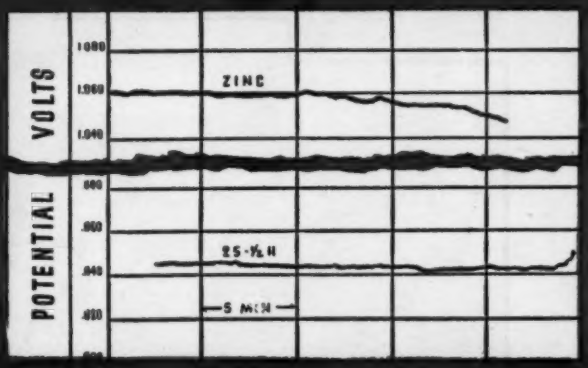
Cleveland... MACHINE Company... Ohio

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS



Cathodic Protection

"Will it work for me?"



This time-potential curve shows that zinc will protect the aluminum in the solution in question

Measuring and recording solution potentials of zinc and aluminum simultaneously under service conditions

All structural metals are affected to a varying degree by corrosive agents. Aluminum alloys, of course, are highly resistant to much of this attack, accounting for their widespread use in many types of equipment. But even aluminum sometimes requires extra care to extend its life—cathodic protection, inhibitors, protective coatings.

The airplane builder employs cathodic protection when he uses alclad aluminum alloy for the skin of his plane; the outer coating of this sheet electrolytically protects the inner, high strength aluminum-alloy core. Processing equipment is similarly protected when zinc strips are added to sidetrack the attack from the aluminum.

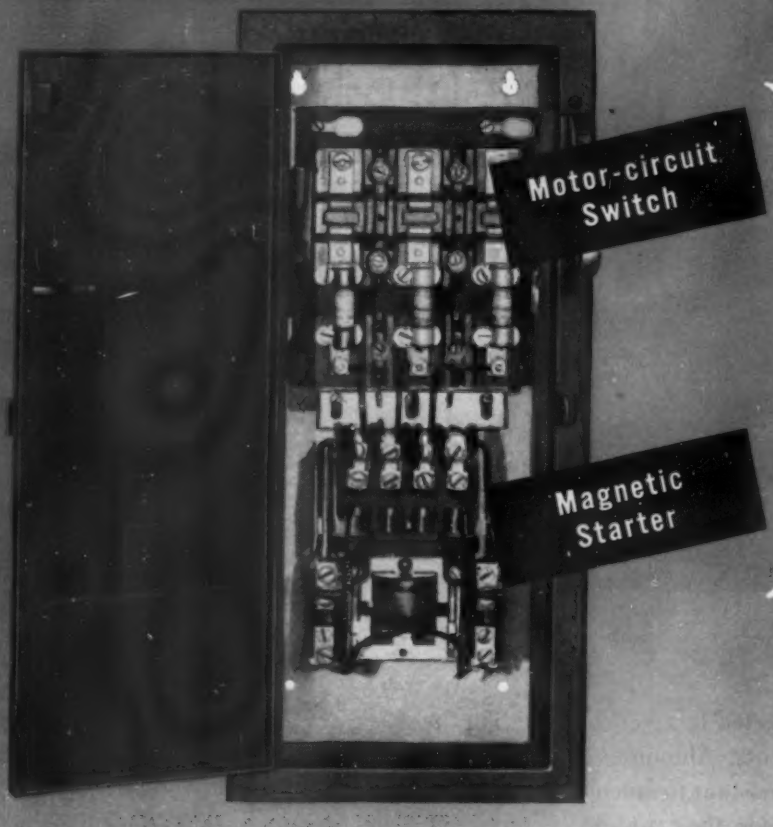
The question, "Will cathodic protection work for me", is continually being answered by Aluminum Research Laboratories for buyers of Alcoa Aluminum. The test is made by duplicating the materials to be employed in the equipment, and by simulating service conditions. If zinc proves anodic to the aluminum alloy, it is safe to say, "Cathodic protection will work there".

If you are wondering how to extend the life of your equipment, call on Alcoa. Our engineers and chemists have spent a lifetime perfecting ways of making Alcoa Aluminum Alloys serve best. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

WHY TWO DEVICES?

ONE CAN DO THE JOB



COMBINATION STARTER

Gone are the days when you had to buy a separate device for each function of motor control. Now, whatever your plant's operating conditions, you can get *combination* control. This means a motor-circuit switch (with short-circuit protection) and a magnetic starter—in one, compact, easy-to-mount unit. Look:

50% reduction in mounting time
Mount only one device, not two.

40% reduction in wiring time
Connect to only 9 terminals, not 15. The switch and starter come already connected.

Increased safety
Cover cannot be opened while there is power on the starter.

Reliable motor protection
Protection devices co-ordinated in starter at the factory.

Saving of wall space
The one device takes less space than two.

Improved plant appearance
Single, streamlined case — less open wiring and conduit.

Look over the selection on the next page—and then mail the coupon for more information about the G-E combination starter best suited for your job.

GENERAL ELECTRIC

GENERAL PURPOSE

THE TYPE 1 ENCLOSURE is suitable for general-purpose, indoor applications where atmospheric conditions are normal. Available up to and including NEMA size 5.

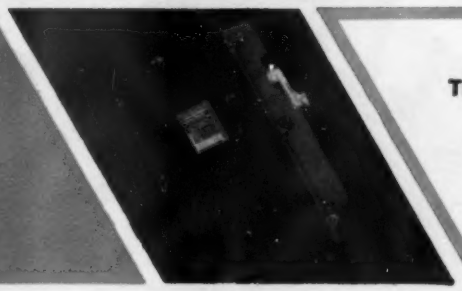
INFORMATION IN BULLETIN GEA-3715

CORROSION RESISTANT

THESE STARTERS are made in two forms—one for corrosive atmospheres (Type 3) and one for hazardous locations (Type 8). All arcing parts and terminals (of forms for hazardous locations) are at least six inches under oil.

INFORMATION IN BULLETIN GEA-3541

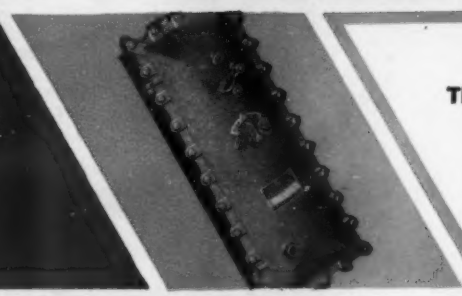
DUST-TIGHT



THE TYPE 5 ENCLOSURE is for use in steel mills, cement mills, and other locations where the dust content of the atmosphere is so heavy as to make a dust-tight case desirable. The cases are heavy sheet metal, equipped with heavy gaskets, clamping bolts, and wing nuts.

INFORMATION IN BULLETIN GEA-3715

OR HAZARDOUS LOCATIONS



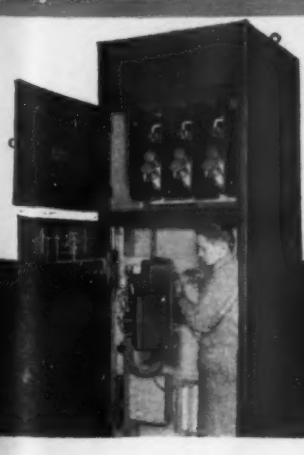
THE TYPE 7 CASE for Class I, Group D, locations is made of cast, high-strength alloy. These starters are designed to withstand internal explosions. The flanges, which are securely bolted on all sides, are grounded to tolerances that will not permit the escape of hot gases.

INFORMATION IN BULLETIN GEA-3804

WATERTIGHT

THE TYPE 4 CASE is suitable for outdoor use, and for damp places indoors, such as dairies, breweries, and ship docks. The cases are of cast iron, or fabricated boiler plate, with a special weatherproof finish and corrosion-proof fittings.

INFORMATION IN BULLETIN GEA-3715



NEW HIGH-VOLTAGE COMBINATION

This recently developed combination starter provides split-cycle protection and starting means for 2300- and 4000-volt motors.

INFORMATION IN BULLETIN GEA-3660

BUY WAR BONDS

Which of these bulletins may we send you?

General Electric Company, Section G 676-95
Schenectady, N. Y.

Please send me the publications checked below.

- ☐ GEA-3715 — General purpose, dust-tight, watertight
- ☐ GEA-3804—For hazardous locations
- ☐ GEA-3541 — Corrosion-resistant
- ☐ GEA-3660—For high-voltage service

Name.....

Company.....

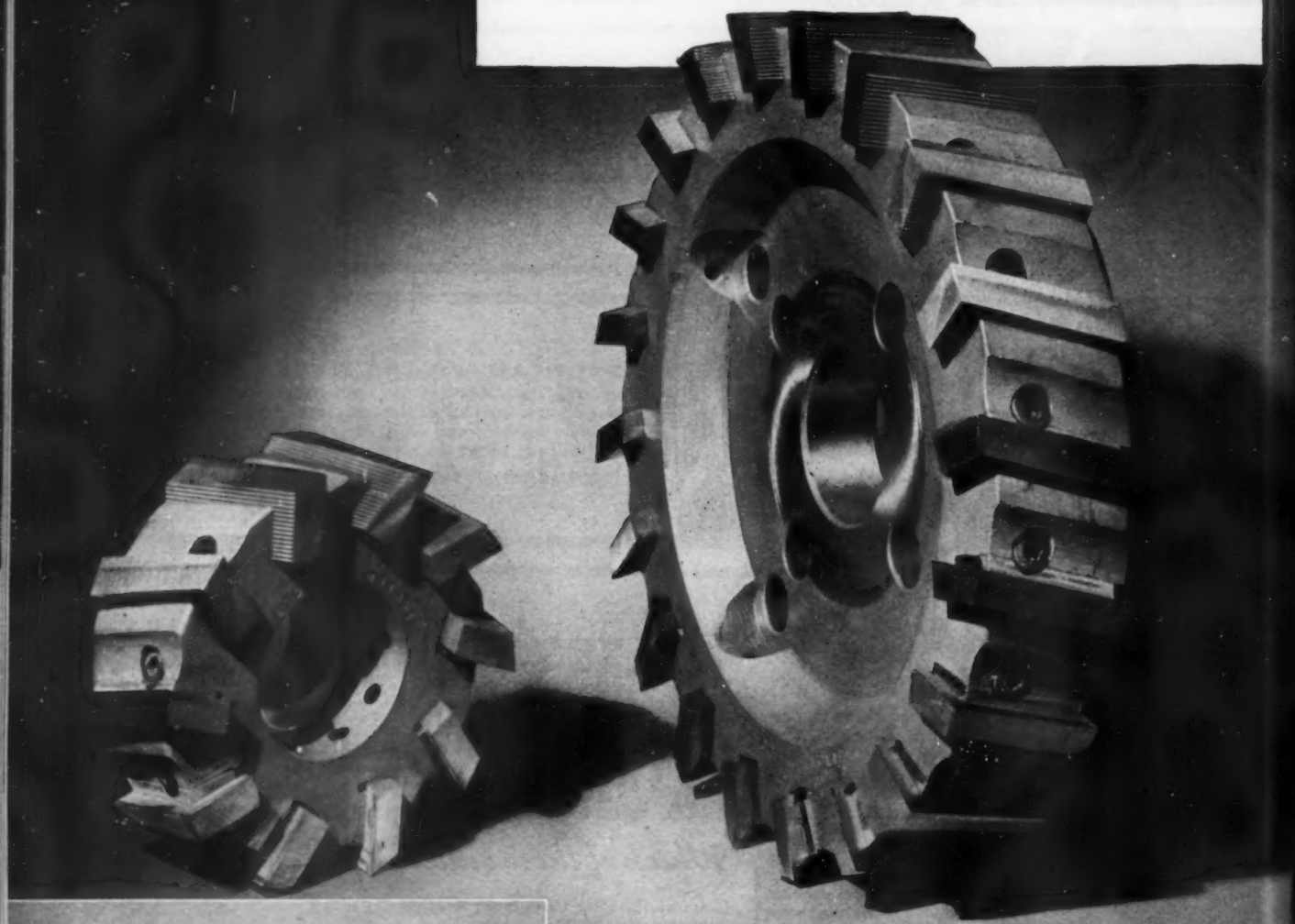
Address.....

City..... State.....

IMMEDIATE DELIVERIES ON

TYPE NX Heavy Duty Series face milling cutters designed for general purpose work are suitable for taking ½" cuts on both the face and periphery in cast iron or steel. Serrated high speed steel blades are locked in the cutter housing by wedges and screws. Chip clearance is milled in the housing to prevent chips clogging on heavy cuts. The following sizes are available in stock both right and left hand:

Cutter No.	Diameter	No. Blades	Cutting Face on Periphery	Price
8104X	4"	10	1–¾"	$30.00
8106X	6"	10	2–½"	35.00
8108X	8"	14	2–½"	45.00
8110X	10"	18	2–½"	60.00
8112X	12"	20	2–½"	78.00



Ingersoll manufactures a complete line of inserted blade type milling and boring cutters for all purposes. Your inquiries will receive prompt attention.

THE

THESE INGERSOLL FACE MILLS

SHEAR CLEAR Heavy Duty Series face milling cutters will outperform any existing designs for work in tough steel and in the soft, stringy, non-ferrous metals. Designed for ½" deep cuts. The Shear Clear is a patented design using steep negative rake and positive shear angles which cause chips to coil outward away from the cutter. The following sizes with high speed steel blades are available in stock both right and left hand:

Cutter No.	Diameter	No. Blades	Price
7106X	6"	12	$58.00
7108X	8"	16	75.00
7110X	10"	20	100.00
7112X	12"	22	120.00

INGERSOLL MILLING MACHINE CO. ROCKFORD ILLINOIS

EVERY DEMAND FOR SAVINGS IS BEING MET . . .

. . . in "The Tools You Buy Again"

Small tools — at the business ends of machines working to capacity — must be capable of making time, labor and material savings in order that production demands be met. UNION TOOLS are meeting such demands in the countless plants turning out war materiel. They are saving time by faster cutting — saving labor by requiring less resharpening — conserving material by assuring accuracy and minimizing spoilage.

The ability of UNION TOOLS to make savings is traceable to an in-built fineness of quality which in turn is the result of UNION'S long, specialized experience in small tool development.

For the sake of savings, it will pay you to standardize on UNION.

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

•

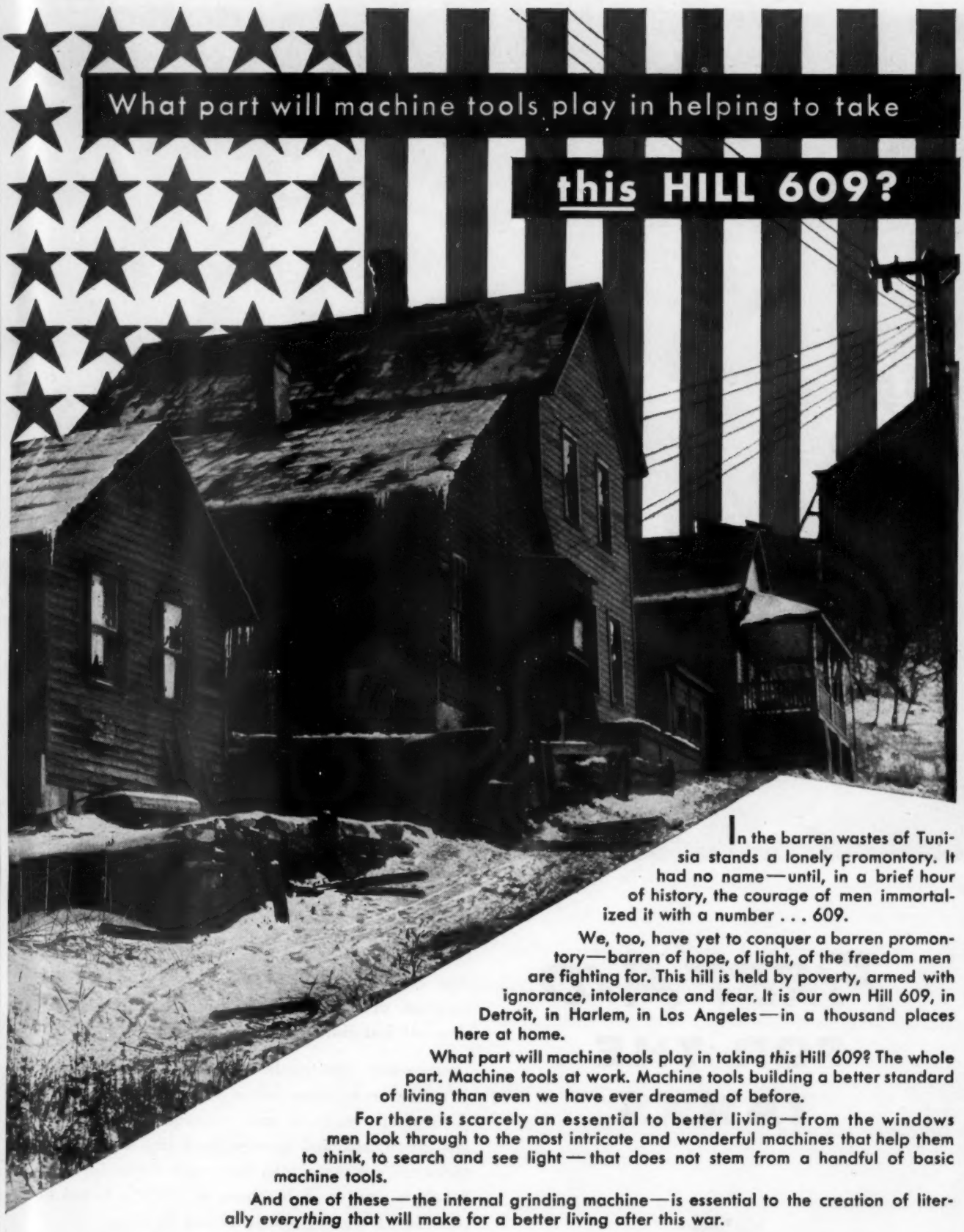
UNION
TWIST DRILL COMPANY
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

UNION

What part will machine tools play in helping to take this HILL 609?



In the barren wastes of Tunisia stands a lonely promontory. It had no name—until, in a brief hour of history, the courage of men immortalized it with a number . . . 609.

We, too, have yet to conquer a barren promontory—barren of hope, of light, of the freedom men are fighting for. This hill is held by poverty, armed with ignorance, intolerance and fear. It is our own Hill 609, in Detroit, in Harlem, in Los Angeles—in a thousand places here at home.

What part will machine tools play in taking *this* Hill 609? The whole part. Machine tools at work. Machine tools building a better standard of living than even we have ever dreamed of before.

For there is scarcely an essential to better living—from the windows men look through to the most intricate and wonderful machines that help them to think, to search and see light—that does not stem from a handful of basic machine tools.

And one of these—the internal grinding machine—is essential to the creation of literally *everything* that will make for a better living after this war.

BRYANT

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

FIRST AID FOR THE TANKS

Hurtling at top speed over rough terrain, fighting dust and dirt as well as enemy shell fire, even the toughest of tanks may occasionally call for mechanical first aid.

Dangerously close to the battle lines, gallant crews of skilled technicians follow with their mobile machine shops ready to make emergency repairs on any ailing tank and speed it back into action. And there are not many jobs they can't do in the field, for their equipment has been carefully selected to provide the utmost versatility and precision.

An essential tool in the mobile shop is the lathe. We are proud that one of our wartime assignments is to supply South Bend *Precision* Lathes for these indispensable units in America's motorized army.

SOUTH BEND LATHE WORKS

South Bend 22, Indiana — Lathe Builders for 37 Years

★ BUY WAR BONDS ★

Van Keuren

THREAD MEASURING WIRES
A *Standard* FOR ACCURACY IN LEADING WAR PRODUCTION PLANTS

The wire system of thread and gear measurement is easy to use and gives exceptionally accurate results. Our Manual of precision measuring tools gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable handbook!

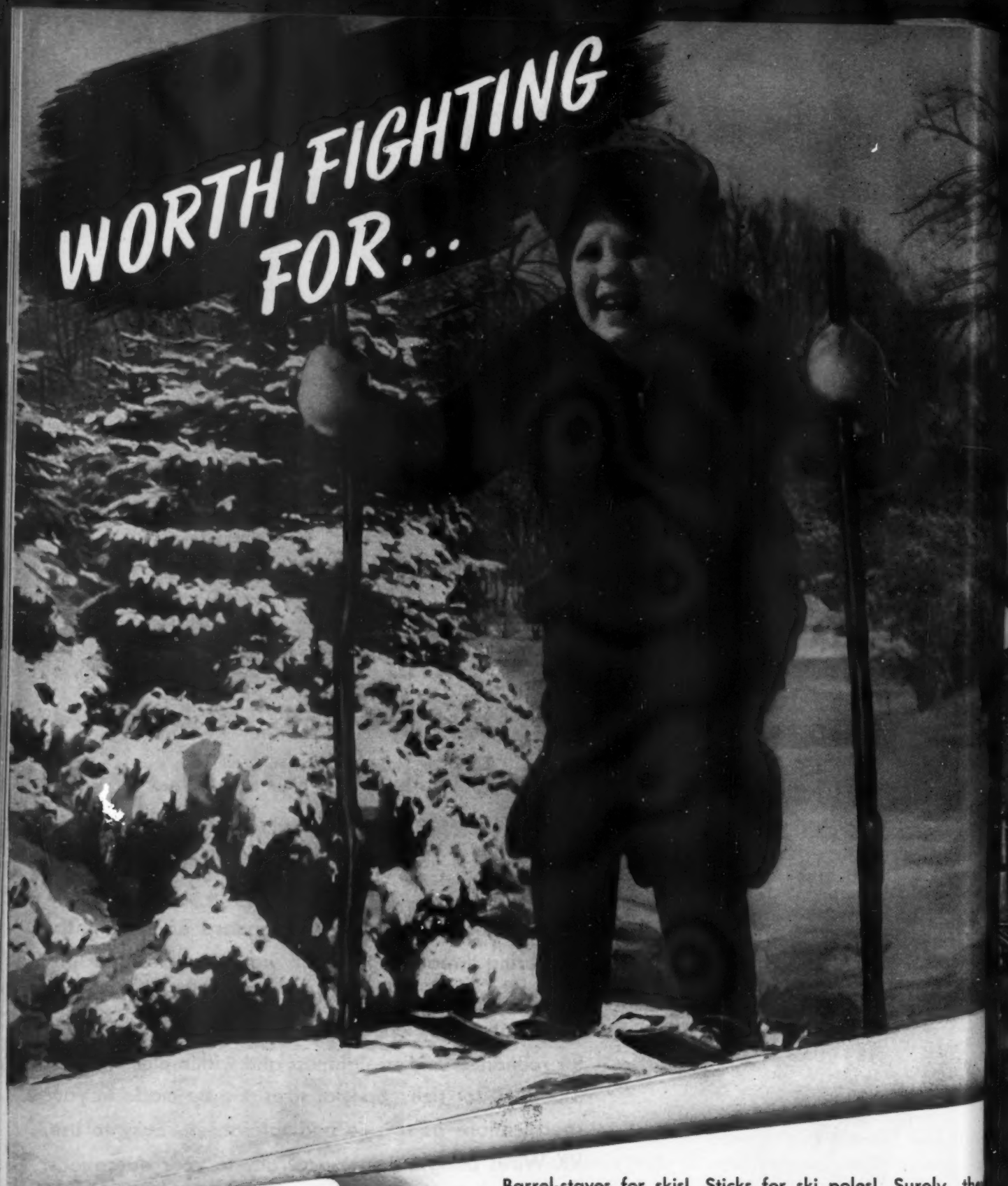
Leading arsenals and war production plants know the importance of accuracy in thread and gear measuring. That is why so many of these plants are using Van Keuren Measuring Wires as standard equipment for measuring thread gages, taps, worms, splines and spur gears. Made in any size from 1.5708" down to .002" in diameter, they are guaranteed to be within .00002" for roundness and straightness and within plus or minus .000025" for size. Special sizes can be made to your specifications as to size and tolerances. Easy to use, VK Wires bring ultimate accuracy to your operations. Write for full details.

Van Keuren

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

24th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles



Precision Built Milling Machines Since 1888

KEMPSMITH

KEMPSMITH MACHINE COMPANY • MILWAUKEE 14, WIS., U. S. A.

Barrel-staves for skis! Sticks for ski poles! Surely, they typify the inventiveness and ingenuity of American Youth. But before we can direct their energies to worth-while peaceful pursuits, the Axis must be given a crushing blow. Our boys are doing their part on the fighting front. Now it's up to us to put forth our best efforts on the production front . . . work steadfastly . . .

STAY ON THE JOB!

MEETS CLOSE TOLERANCES AND MAINTAINS THEM

ARMY E NAVY

Fosdick Jig Borer

The Fosdick Jig Borer illustrated is maintaining tolerances of .0002 inch on boring operations on this alloy pump body casting.

Fosdick Jig Borers are being used extensively in tool rooms and tool and die shops throughout the country because of their ability to perform precision drilling, reaming, boring, facing and similar operations accurately—quickly—without the use of specially trained operators.

There are many jobs which can be done on a Fosdick Jig Borer, where the run is comparatively small, and save the cost of expensive jigs or fixtures. Another important advantage—the initial cost of this machine is considerably less than heavy machine tools often used to accomplish the same degree of accuracy.

Here is a versatile machine—economical both in first cost and operation.

Consult Fosdick on your percision boring, drilling, tapping and similar operations. The Fosdick Jig Borer Bulletin J.B.A. gives detailed information and several typical installations. Write for one today.

FOSDICK MACHINE TOOL COMPANY

CINCINNATI 23, OHIO

Speeding Deliveries

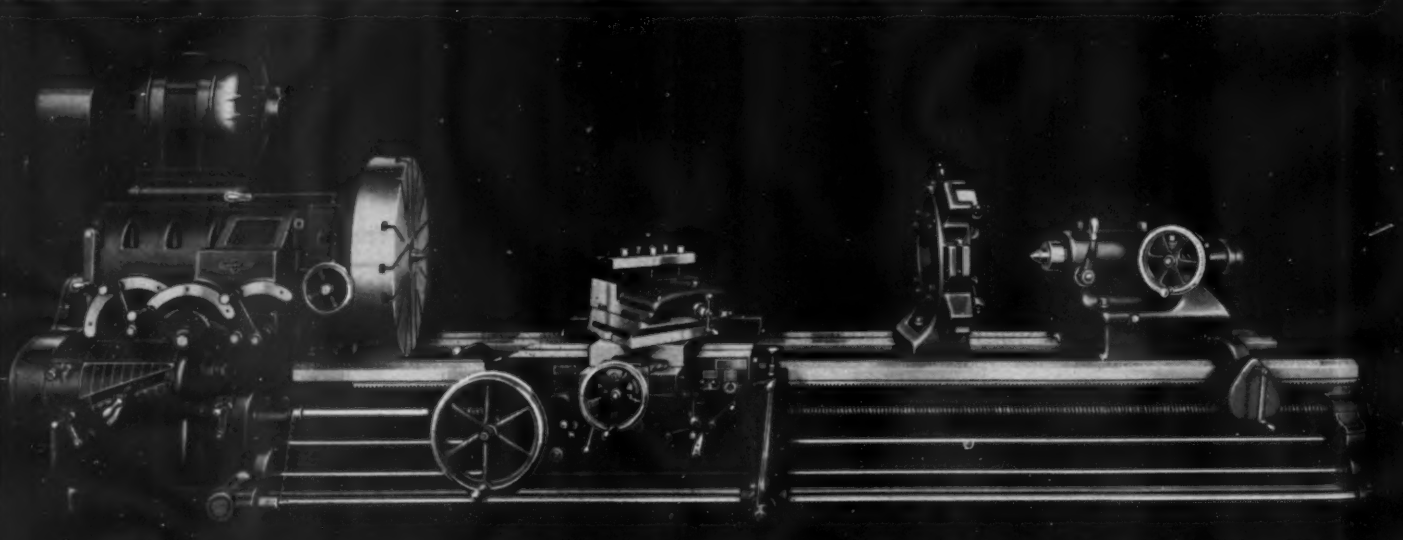
TO THE AXIS !

"American" Lathes are doing a real speed-up job in producing torpedoes for "delivery to the Axis".

Here is one of a battery of 42" "Americans" machining torpedo air flasks with eight tools cutting simultaneously. This job demands power and stamina far in excess of the average lathe job. "Americans" were selected—"Americans" are doing the job.

The Amertorp Corporation, one of the world's largest and finest torpedo manufacturing plants, employs many "American" Lathes for a great variety of torpedo machining operations.

We are proud of the part "American" Lathes are playing in the production of this masterpiece of destruction.



THE AMERICAN TOOL W

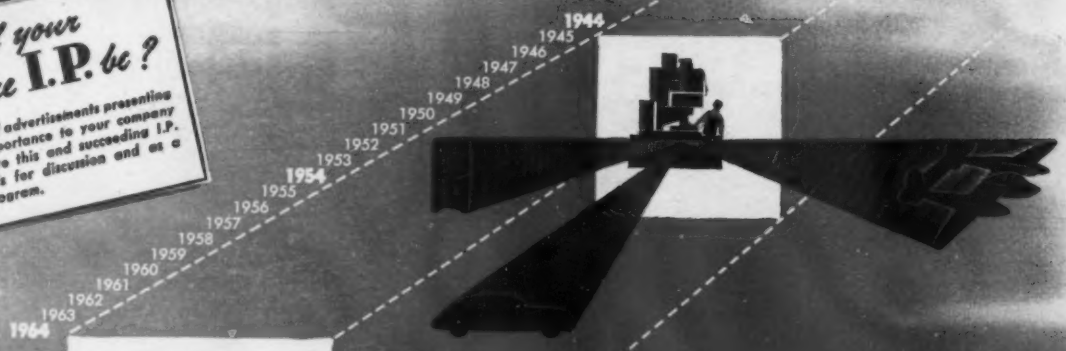
LATHES AND RA

CINCINNATI OH

OL WORKS COMPANY
ND RADIAL DRILLS
TI OHIO, U. S. A.

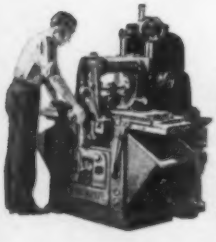
What will your future I.P. *be?*

This is the First of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.



50%
increased output per man-hour every 10 years*

Will your production make this National †† Industrial Par?



RESEARCH reveals that in the 12 years, 1929-1941, the nation's output per man-hour increased 34%. The rate is 2½% per year compounded. And there is ample evidence accumulating that the rate will advance to at least 4%. War — the supreme national productive effort it calls for — accelerates man-hour output. Improved production techniques — developed in war — carry over into peacetime; the pent-up buying power released after Victory will tremendously stimulate production.

Thus manufacturers who intend to keep step with a high level of national prosperity — the volume production which means more goods for more people at lowest cost, and security of jobs and wages for the greatest number of workers — must strive to increase their output per man-hour 50% every 10 years.

To put it another way, American industry sets a definite national industrial PAR for man-hour output or production — 4% compounded per year rate of increase. The management of your company can determine its own competitive standing in terms of its ability to make or break this PAR.

Every industrial executive knows the key importance of machine tools in reaching production goals. Machine tools were basic to the phenomenal achievement of the American aircraft industry in attaining and surpassing the 60,000 plane quota set at the beginning of the war. The majority of the war industries — all machine tool users — were able to produce at a rate far in advance of the time-tables set for them.

Manufacturing for peacetime markets is as much of a challenge as manufacturing for war. To make better products — faster — at lower cost — will call for the newest and finest machine tools — essential implements of production efficiency and the increased output that means security of jobs and wages.

Back the attack **BUY MORE BONDS**

Spotlight facts for your future I.P. *planning*

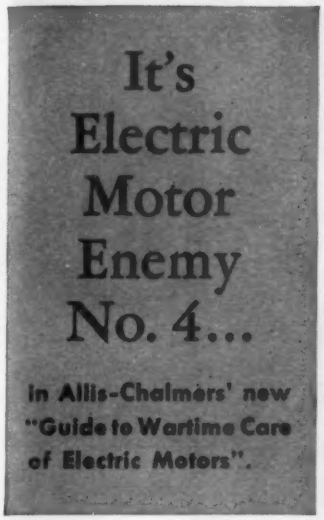
* Production methods — developed in wartime —increase man-hour output; pent-up buying power — released in peacetime — demands increased production.
* The rate of 2½% increase per year output per man-hour, established by a 12 year record of industrial production, can be expected to reach at least 4% per year — compounded.
* Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.
* Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*
* The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

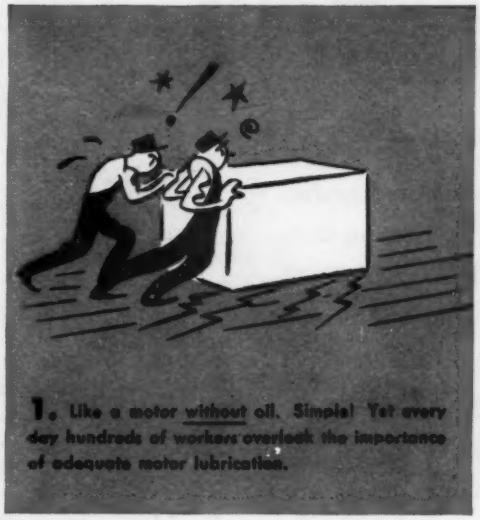
†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

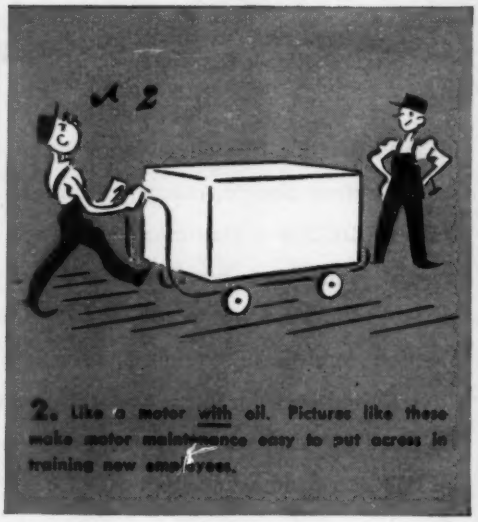
KEARNEY & TRECKER
CORPORATION
MILWAUKEE 14 WISCONSIN

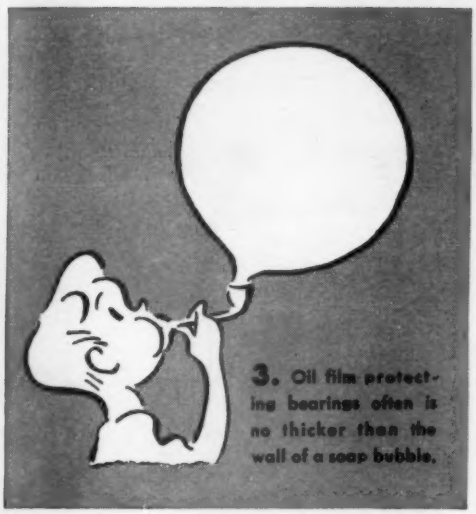
Milwaukee Machine Tool

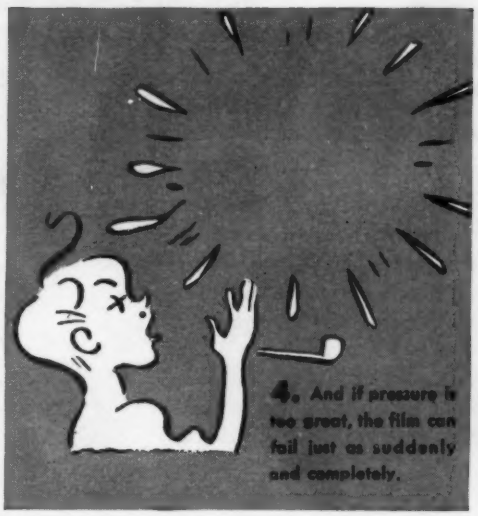
FIGHT FRICTION!

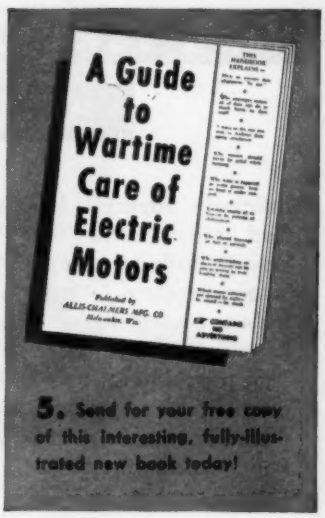



1. Like a motor without oil. Simple! Yet every day hundreds of workers overlook the importance of adequate motor lubrication.








A Guide to Wartime Care of Electric Motors
5. Send for your free copy of this interesting, fully-illustrated new book today!

ONE OF A MOTOR'S most dangerous enemies is friction. In peacetime, instructions for guarding against it were based on 8-hour-day, 6-day-week operation. Today, with motors working up to *3 and 4 times* as many hours a week, those instructions are dangerously obsolete!

To help put U. S. motor maintenance on an efficient wartime footing, Allis-Chalmers has published "Guide to Wartime Care of Electric Motors". This valuable book explains the *9 main enemies* of electric motors . . . tells you how to fight them. Its recommendations are simple and practical . . . ideal for training new men or as a review for experienced men. Book is fully illustrated with stimulating, understandable sketches like those shown above—*contains no advertising*. Over 100,000 copies in use by industry and armed forces. Send for your *free* copy today! ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WIS.

A 1658

ALLIS-CHALMERS MOTORS

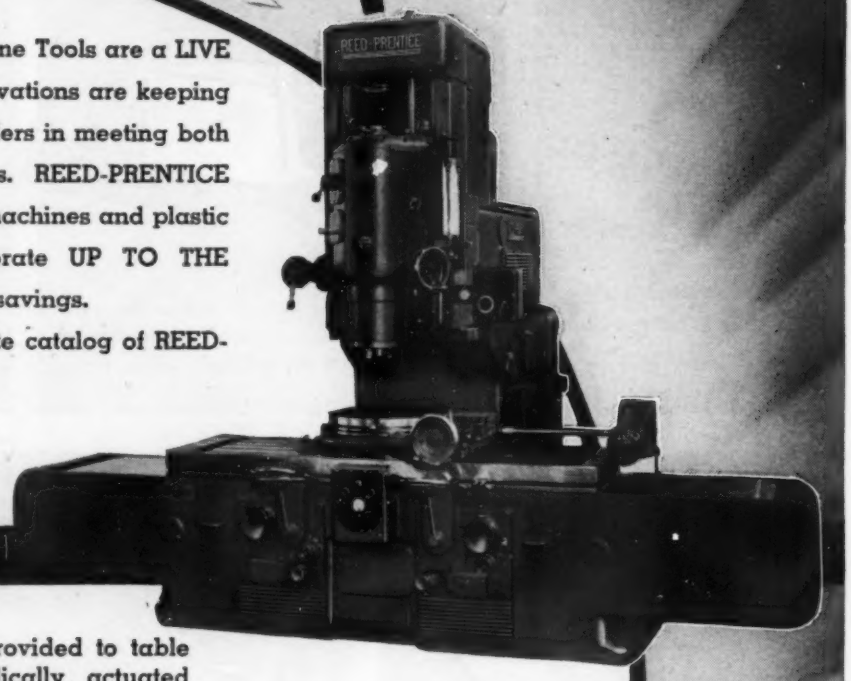
When you do need new motors, look into the strength, solidity and all-around protection of the new "Safety Circle"—protected top, sides, ends and bottom

A-C WE WORK FOR VICTORY WE PLAN FOR PEACE

A LIVE LINE!

REED-PRENTICE Machines and Machine Tools are a LIVE line. Constant developments and innovations are keeping REED-PRENTICE tools among the leaders in meeting both present and post war requirements. REED-PRENTICE lathes, milling machines, die casting machines and plastic injection molding machines incorporate UP TO THE MINUTE devices for time and labor savings.

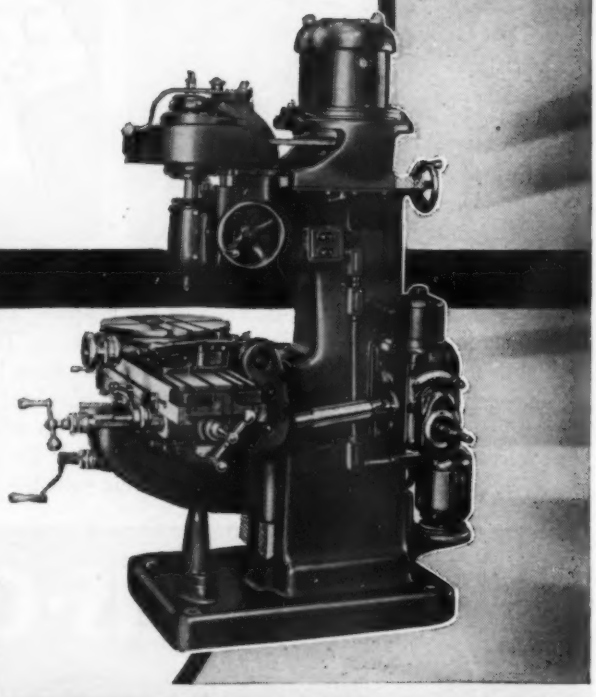
We shall be glad to supply a complete catalog of REED-PRENTICE products upon request.



No. 4 VERTICAL MILLER

Infinitely variable feed rates are provided to table and cross slide through hydraulically actuated screws. Infinitely variable feed rate for spindle feeds is accomplished through electronic control. All controls are centralized and convenient to the operator. Especially large table measures 24" x 84".

This machine is truly a fine engineering accomplishment and has proven superior in many installations. Can be supplied with either rotary table or duplicating attachment.



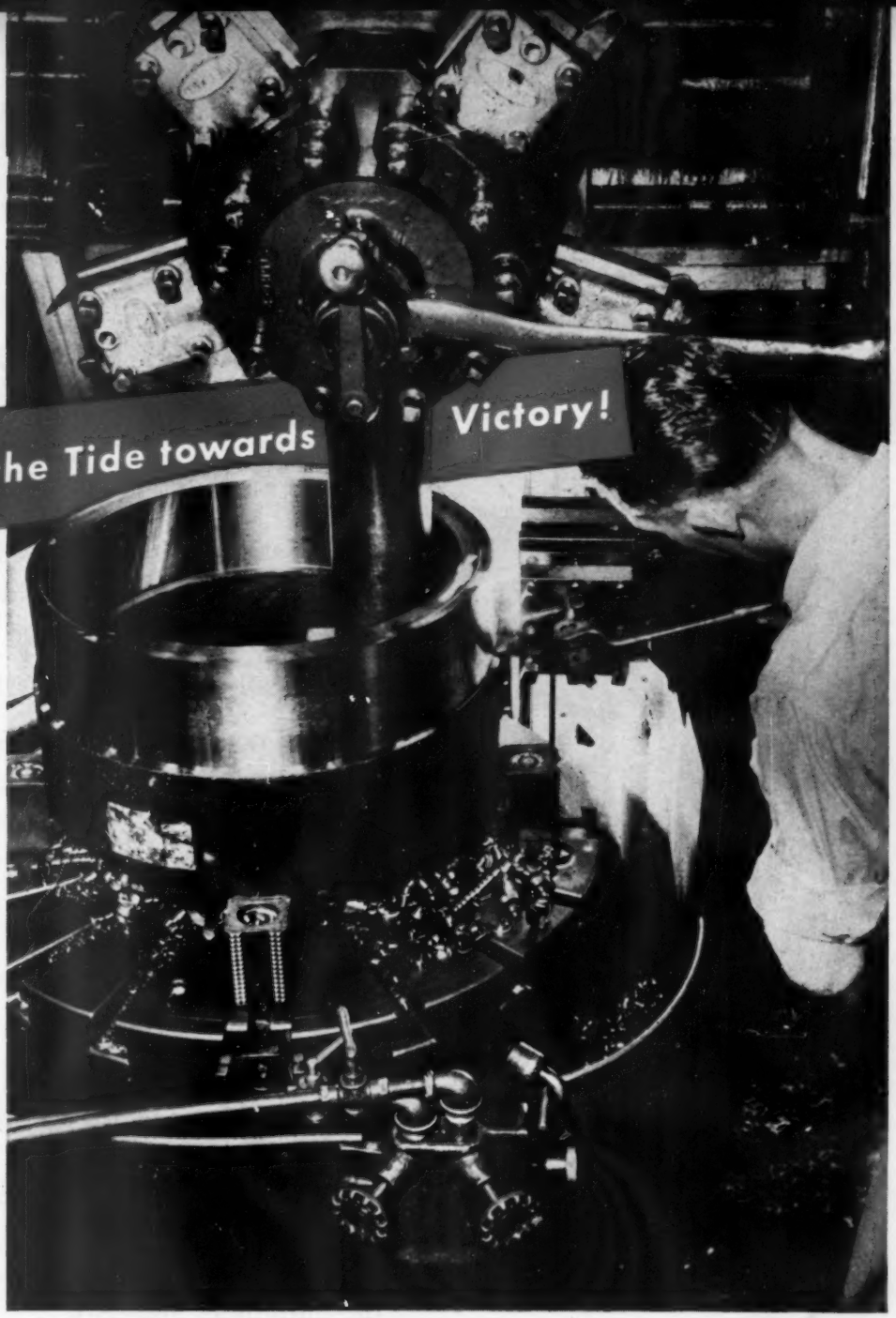
No. 3VG VERTICAL MILLER

This milling machine is highly regarded in the general manufacturing field. This is especially true in the case of manufacturers of gun and aircraft engine parts as well as with manufacturers engaged in die and tool making. The table working surface is 10¼" x 36", longitudinal feed 24", cross feed 12", vertical adjustment of knee 18", adjustment head on column 5", range, spindle speeds 100-4000 RPM.

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland. Ohio
75 West St.
New York City. N. Y.

REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.



Big jobs on big, high powered and fast machines—jobs held to extremely fine limits of accuracy. That's the formula which spells success to the Marine Construction program. One of these big jobs is illustrated above . . . turning and boring a part for a Marine Turbine . . . the censored production data would shock the enemy . . . the accuracy, typical of all work on Bullards, is easily held to very close limits. For obviously the machine is the famous Bullard Vertical Turret Lathe, with rapid power traverse for the swiveling turret head. Two heads cutting simultaneously with independent feeds shorten cutting time. Indexing of one head while the other continues its operation cuts lost time between cuts. Consult with Bullard engineers for aid in TURNING the tide towards Victory!

BULLARD ★★ VERTICAL TURRET LATHES

★

THE BULLARD COMPANY

BRIDGEPORT 2, CONN.

—then he said to himself

"The LIE is my political weapon"

At the start of his activity, Adolph Hitler proclaimed to the world that his weapon was the LIE

—the all-out undiluted LIE

—and now see what happens to a structure founded on bosh:

(a) the theory of the blitz *blasted*

(b) the legend of invincibility *exploded*

(c) the infallibility of his "intuitions" *fizzled*

He could have fooled a lot more people for a lot longer time, if he had only tried the trick of nursing along old truths—now turned into fallacies—but still adhered to by the unthinking majority.

For *Progress* has a way of flipping the FACTS of yesteryear into FLOPS almost overnight. The follower of an OUTDATED fact may easily find himself nursing a progress-blocking FLOP.

Here, Adolph, are samples
of yesteryear FACTS now turned FLOPS

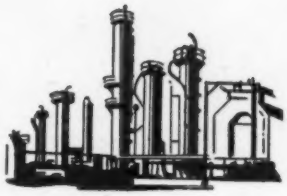
FLOPPED FACT 1:
"You can't produce all-welded ships" . . . . . .

....Recourse to arc welding has filled the seven seas with them.

FLOPPED FACT 2:
"You can't arc weld high-temperature, high-pressure piping" . . . . . .

....The one safe way is through recourse to arc welding.

FLOPPED FACT 3:
"You can't weld cracking stills" . . . . . .



....Without recourse to arc welding—our armed forces would be without high octane gas.

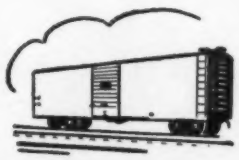
FLOPPED FACT 4:
"You can't produce army tanks with arc welding" . . . . . .

....Through recourse to arc welding—it's the only kind they're producing today.

FLOPPED FACT 5:
"You can't erect buildings by arc welding". . . . . .

....Savings in steel and money are represented in thousands of structures of every type—through recourse to arc welding.

FLOPPED FACT 6:
"Railroad cars are taboo for arc welding". . . . . .



....Watch them rolling the rails in every state—through recourse to arc welding.

THE LINCOLN ELECTRIC COMPANY • CLEVELAND 1, OHIO

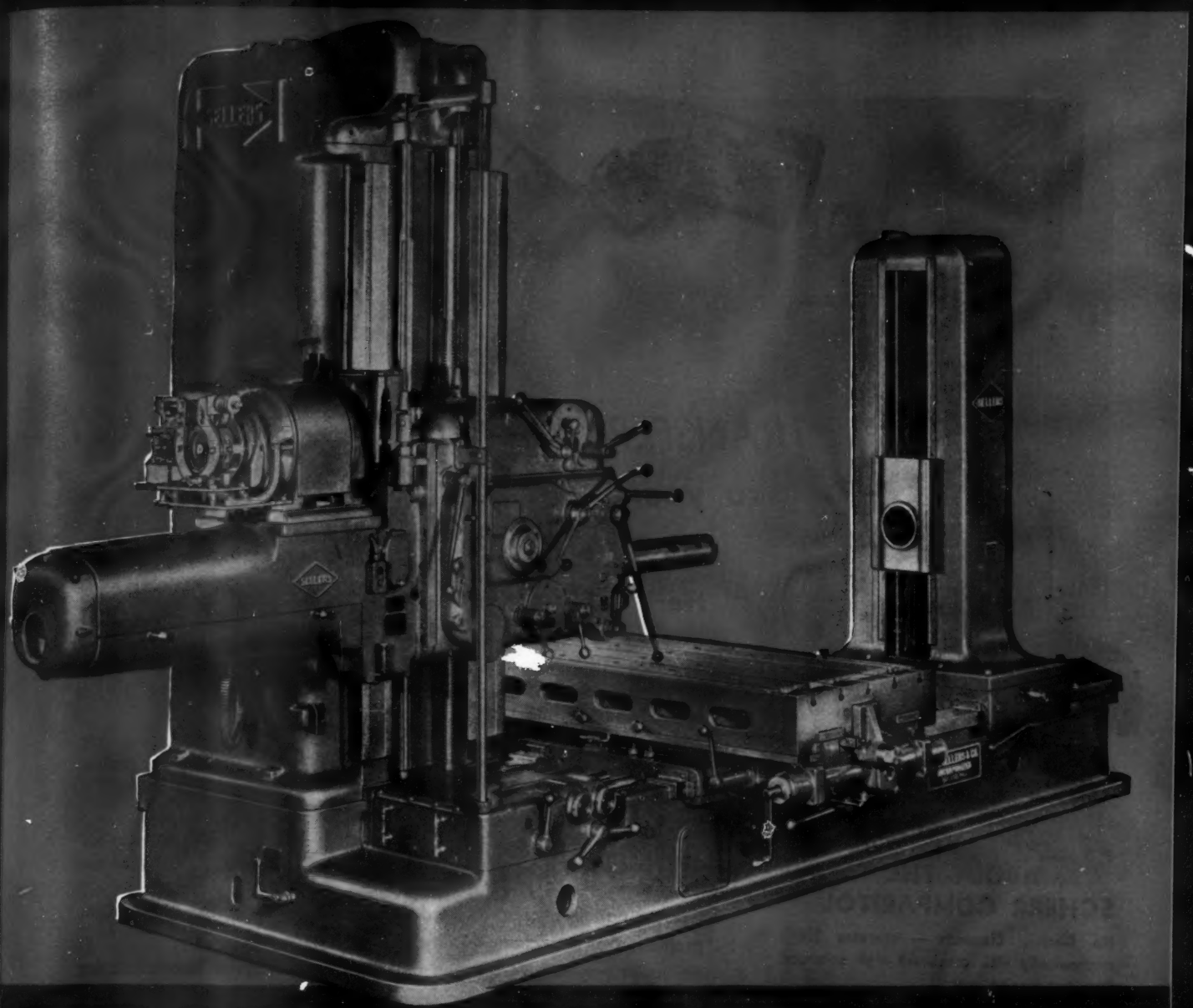
America's greatest natural **recourse**

ARC WELDING

HARDINGE
ELMIRA, N.Y.

Style "B" Master Feed Fingers and Pads
HARDINGE Precision Collets and Feed Fingers for
all makes of Automatics, Turret Lathes and Chucking Machines
Style "S" Sure Grip
Master Collets and Pads

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



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Boring, Drilling and Milling Machine

One of the World's Most Versatile Machine Tools

With uncompromising accuracy these powerful many-purpose machines show unusual capacity for a variety of jobs. They bore, mill, drill and tap and save greatly in handling time by performing several operations in one set-up.

The Sellers Unit Head, combining motor and spindle in one unit, provides a flexible, centralized control which promotes the accuracy and speed of every operation . . . They are proven profit producers . . . Made in spindle sizes from 5 to 10 ins. . . . Write today for complete mechanical data. Wm. Sellers & Company, 1610 Hamilton Street, Philadelphia, U. S. A.

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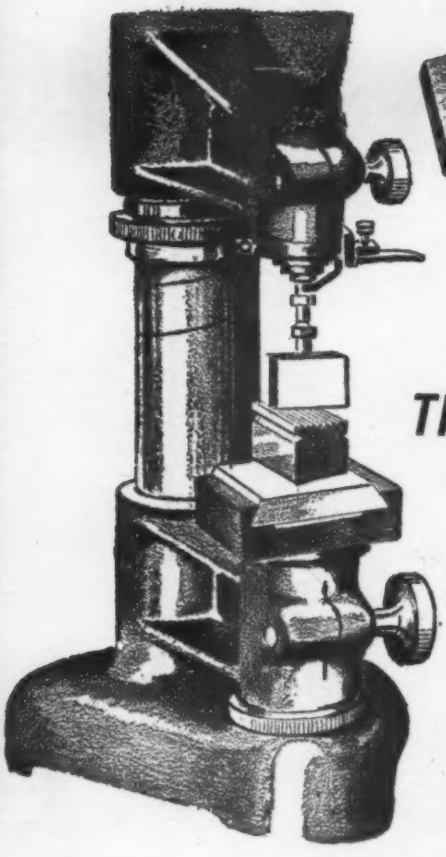
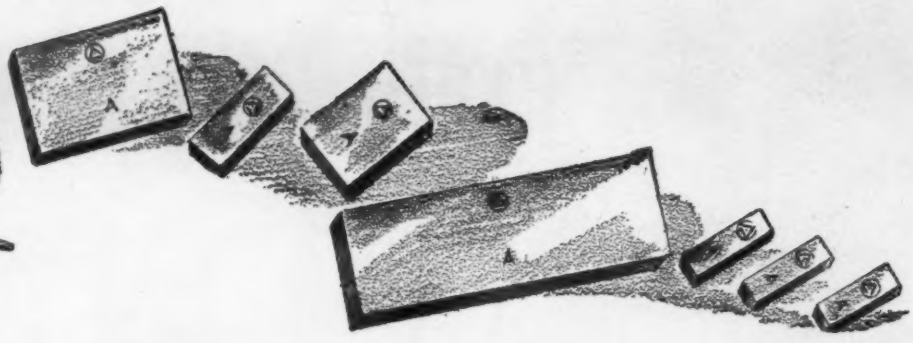
PRECISIONEERING SINCE 1848 — SELLERS





TRANSFER GAGE BLOCK ACCURACY

to your Work . . . . with the

SCHERR COMPARITOL

Here's a simple, low cost way to meet today's precision standards

The COMPARITOL enables you to apply your gage blocks to greater advantage because it provides a practical, simple and fast means of transferring gage block precision directly to the part being produced.

By using the COMPARITOL in conjunction with your gage blocks, you are assured of attaining measurements to closest tolerances without depending on individual measuring skill or feel and without variations due to the human factor.

When you use the SCHERR COMPARITOL to transfer gage block accuracy to your close tolerance inspection, you are assured of the following direct benefits:

. . . finished part inspection reduced to a fast, fool-proof visual operation.

. . . promotion of interchangeability and trouble-free assembly.

. . . an easier way to give all shop tools and gages regular inspections for accuracy and wear.

. . . faster production and lower cost through savings in inspection time.

Facts ABOUT THE SCHERR COMPARITOL

No Electric Elements — operates 100% mechanically with consistent high accuracy. Only two moving parts.

Easy to Use — can be used at any convenient point; simple to operate; easy to set. Low Measuring Pressure — an important advantage in checking delicate parts.

Extra Lift of Feeler Point — providing safety to instrument on over-size work.

PRICES

Standard 0-6" Range	$195.00
Heavy Duty 0-8" Range	250.00

Order a COMPARITOL Today on a 10-Day FREE Trial

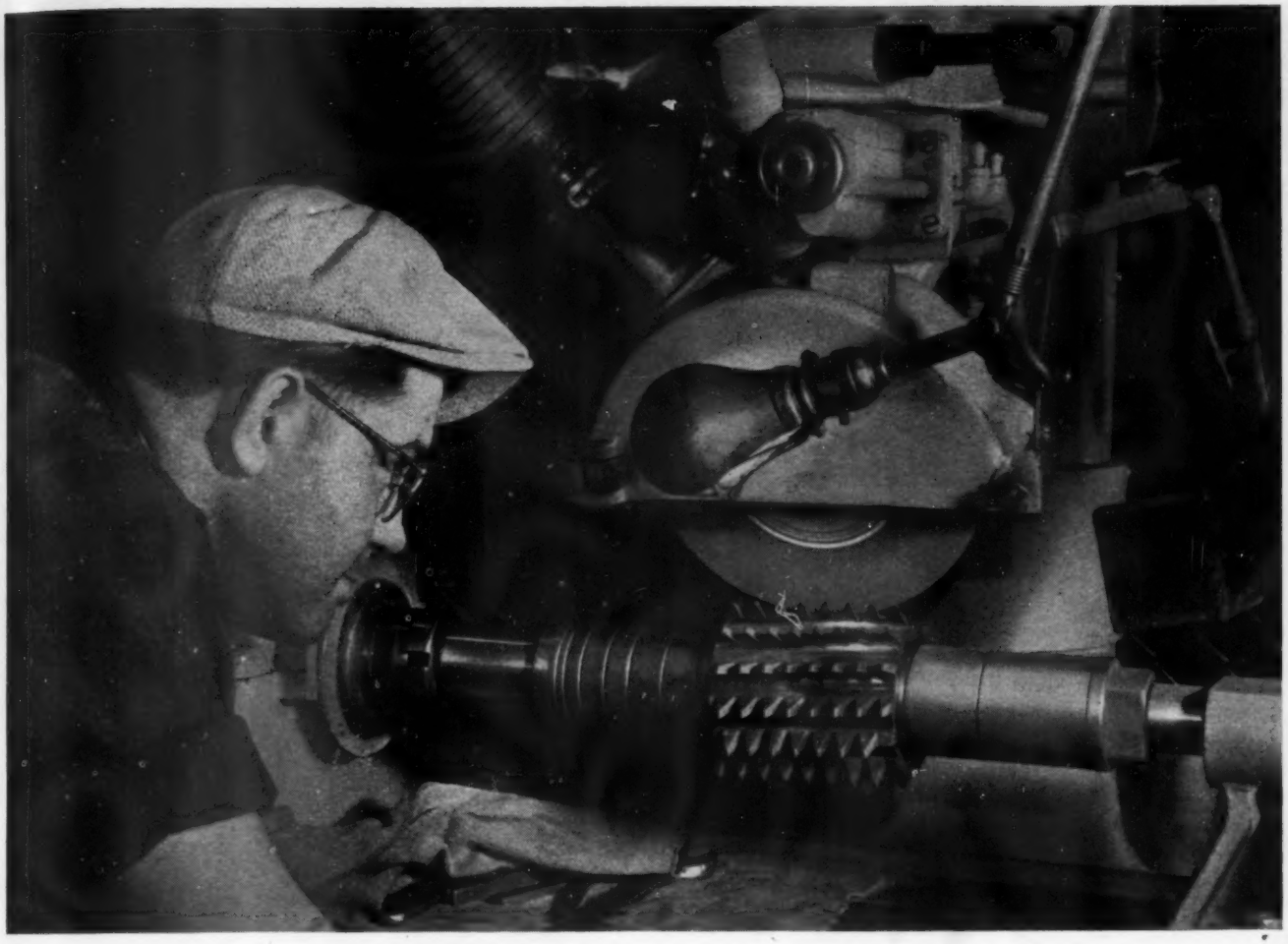
We will ship a SCHERR COMPARITOL on 10 days' approval to enable you to prove its value to you by a comprehensive trial on your work.

SCHERR ULTRA CHEX (Precision Gage Blocks) are available in a set of 34 blocks enabling you to make 80,000 combinations in steps of 1/10,000". Price $125.00.

GEORGE SCHERR CO.

INCORPORATED

124 LAFAYETTE STREET NEW YORK 13, N. Y.



PROPER SHARPENING MEANS LONGER HOB LIFE

SINCE the demand for hobs is still taxing specialized manufacturing facilities beyond capacity, it is important that users of these precision cutting tools employ every possible means to see that each hob delivers its maximum useful life. *Carelessness in sharpening may result in unnecessary waste of potential cutting power.* The original sharpening on the hob must be exactly duplicated when it becomes dull or the hob will lose some of its accuracy and produce unacceptable work. Valuable life is then lost in resharpening it correctly. If allowed to become too dull before it is sharpened, a needlessly large amount of material may have to be removed. Accurate spacing of cutting teeth must be maintained to provide uniform cutting action. A number of our customers have studied this problem in great detail as it applies in their own plants, and have set up sharpening standards resulting in substantial economies. The fundamentals of proper hob sharpening are illustrated and explained on pages 272–282 of our booklet, "How To Get The Most Out Of Your Hobs". We suggest that everyone in your plant who is concerned with the use and handling of hobs be acquainted with these factors in order to *get the most out of your hobs!*

SEE PAGES 272-282

Buy War Bonds

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

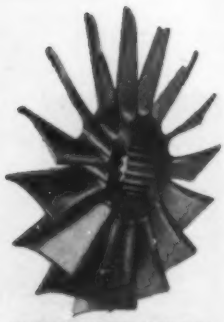
GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

"We could not, in honesty, acknowledge our pride on this occasion without paying a special and public tribute to our fellow employees. To a very major degree, this widely coveted and proudly possessed award now flies above the DeVlieg plant because of their loyalty, their devotion to the job at hand and to their uninterrupted effort. Although this honor comes from past achievement, it is proper to say here that another DeVlieg project now nearing completion will make possible another sensational step-up in the performance of still another type aviation engine."

Chas. B. DeVlieg. H. R. DeVlieg E. P. DeVlieg

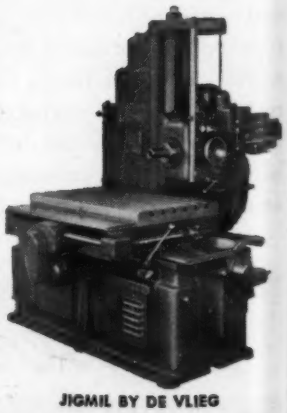
DEVLIEG

FERNDALE - - - MICHIGAN



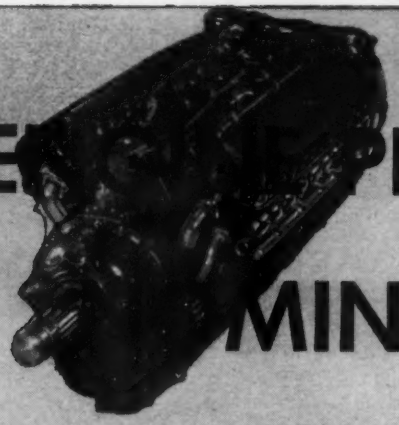
SUPERCHARGER INDUCER BY DE VLIEG

The acceptance of the DeVlieg art by industrial America was originally based on the superiority of DeVlieg milling methods, and the "E" award was conferred for a revolutionary application of these basic methods. This new application involved the development of the process and the machines by which is being produced the inducer portion of *ALL* the superchargers of the Allison and Rolls Royce aviation engines. As a result of this one application of the DeVlieg art, both of these famous engines demonstrate importantly increased performance. At the same time, the inducers themselves are being produced at *FIVE PER CENT* of their original cost with a reduction in required machine tool investment of *NINETY PER CENT!* Today what formerly was a complex manufacturing operation calling for the highest type of veteran craftsmanship is now capable of being performed by women.



JIGMIL BY DE VLIEG

THIS AIRCRAFT E[illegible]PLANT [illegible]MINATES



it's All-American Team

So high is the production-with-precision obtained by broaching that one machine is ample for most metal working plants. Few have as many as 10 or 15.

Consider, therefore, the importance of this particular aircraft engine plant in the broaching picture, with 91 American machines!

Their personnel *knows* broaching. They know the value of dealing with an old-line company whose principals have been identified with broaching since the turn of the century. They know, too, the importance of a *complete* broaching service—machines, tools, and engineering — for winning war production, profitable post-war production.

Significant is this overwhelming vote of confidence in American Broach equipment.

BROACHING IS BETTER
THE *American* WAY

American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

1943

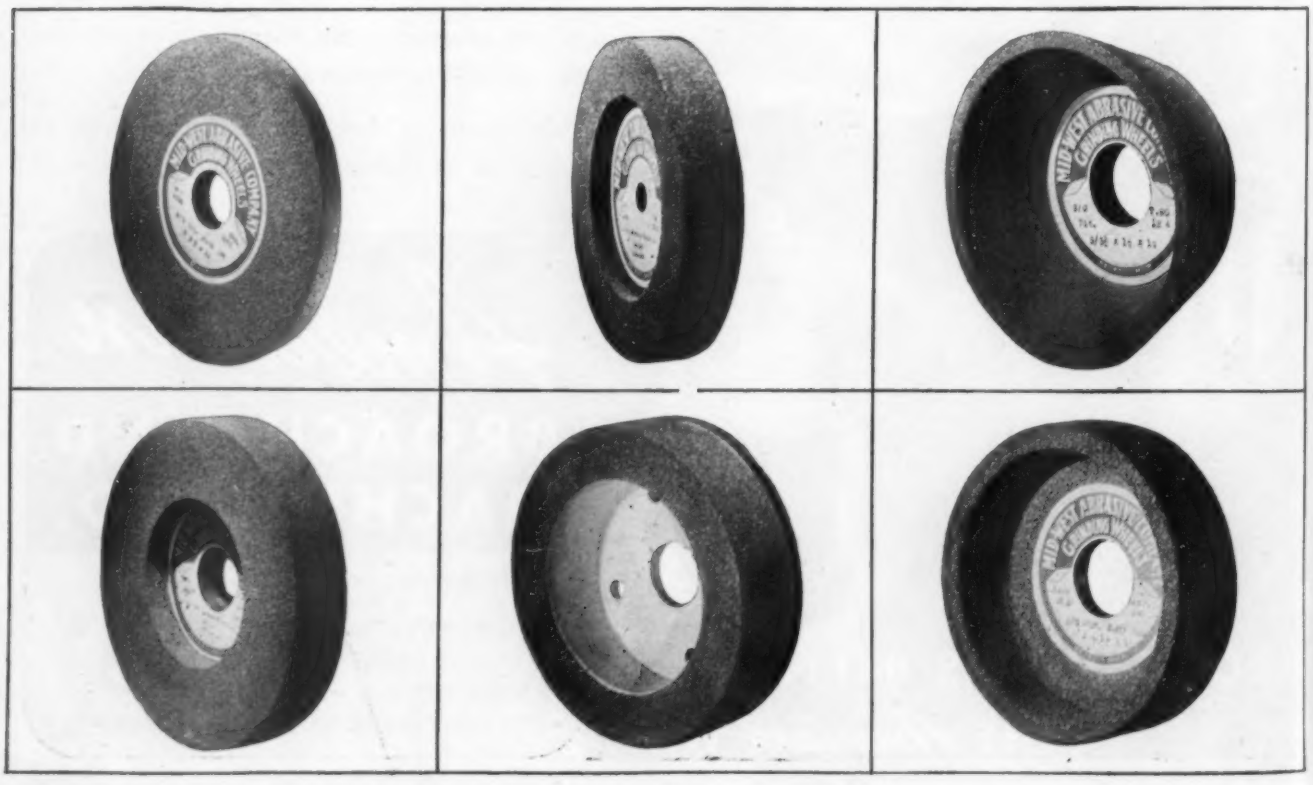
SAW THESE WHEELS REACH "BIG LEAGUE" STATUS

These six MID-WEST "B" BOND grinding wheels — representing part of the MID-WEST carbide tipped tool grinding "team" — were given preliminary "tryouts" in 1942. ¶ During 1943, performing day in and day out in many of America's largest, most productive industrial plants, MID-WEST "B" BOND carbide tool grinding wheels, earned permanent "big league" standing. ¶ Designed and specifically manufactured for grinding any of the numerous types of carbide materials, they have four predominant features:

THEY CUT FASTER • THEY CUT SMOOTHER
THEY CUT COOLER • THEY CUT CHEAPER

Just ask the "carbide man" in any plant using "B" BOND wheels!

MID-WEST ABRASIVE COMPANY
Manufacturers of DEPENDABLE Abrasives
1960 E. Milwaukee Avenue Detroit 11, Michigan



PLEASE *Don'ts*

Unless you are a process engineer responsible for production of

AIRCRAFT ENGINES AND PARTS

Limited Quantity Available for free Distribution to Qualified Men!

48 Pages of Exclusive Detailed Reports on

PROCESS METHODS OF LEADING AIRCRAFT ENGINE AND PARTS MANUFACTURERS

Authentic, detailed production data . . . covering hundreds of machining, cleaning, rustproofing and other operations on aircraft engines and parts . . . have been gathered from leading manufacturers by Quaker Process Engineers and compiled in this manual. Intended primarily for the use and reference of these Engineers, a very limited number of these manuals are now available to men holding positions of responsibility in the actual production of engines and parts. If you are one of these men and desire a copy, please make the request on your Company letterhead.

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- STEEL SPECIFICATION CHARTS
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- DRAWING AND STAMPING OPERATIONS
- METAL CLEANING OPERATIONS
- PROTECTING METALS FROM CORROSION AND RUST
- TECHNICAL DATA SHEETS ON CHEMICAL PRODUCTS USED
- MANUFACTURING THE WRIGHT "CYCLONE" ENGINE

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT . . . Warehouse Stocks in Principal Industrial Centers

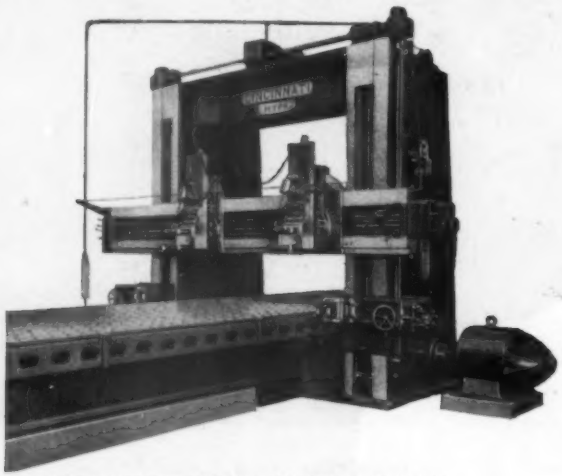
Manpower is the problem of today

● All users of machine tools can help solve this problem by replacing obsolete equipment. Our experience has been that in many cases one of our tools has done the work of two or three antiquated machines they replace.

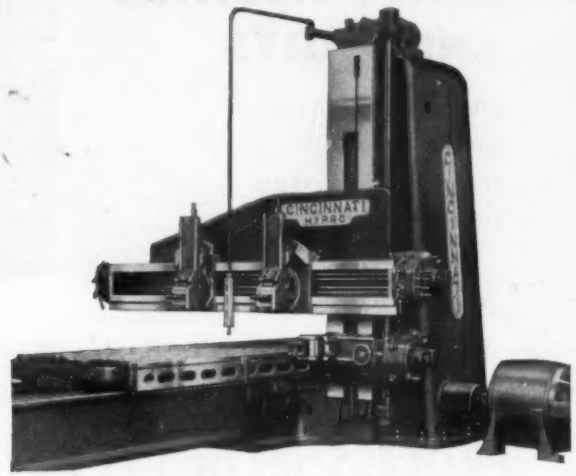
● A new CINCINNATI HYPRO will not only machine parts more quickly—it will produce work that is uniformly accurate—and increase production on your assembly line.

● CINCINNATI HYPRO MACHINE TOOLS require less operator training since they offer the greatest ease of control through fine adjustment handles, saddle control, pendant switches, conveniently placed at the operator's working position.

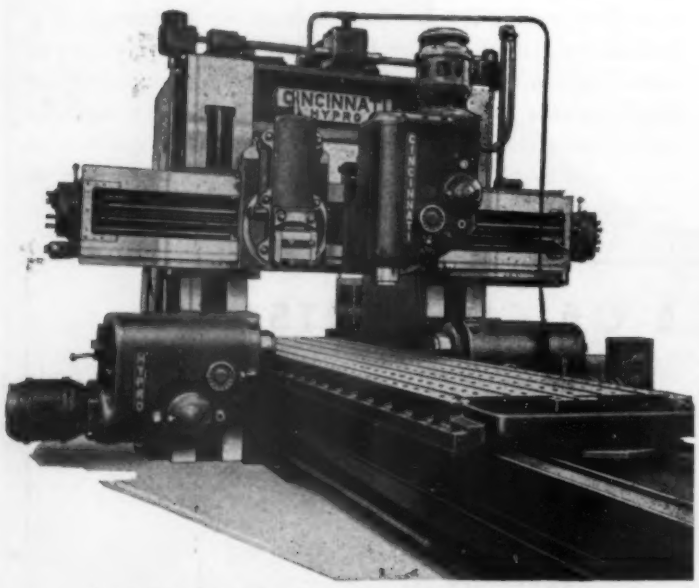
● Get the answer to your manpower problem today —submit your production problems for job analysis with our Estimating Dept.—acquaint yourself with the many exclusive HYPRO-DUCTION features by writing today for Bulletin 153-AM describing the Cincinnati Hypro Line.



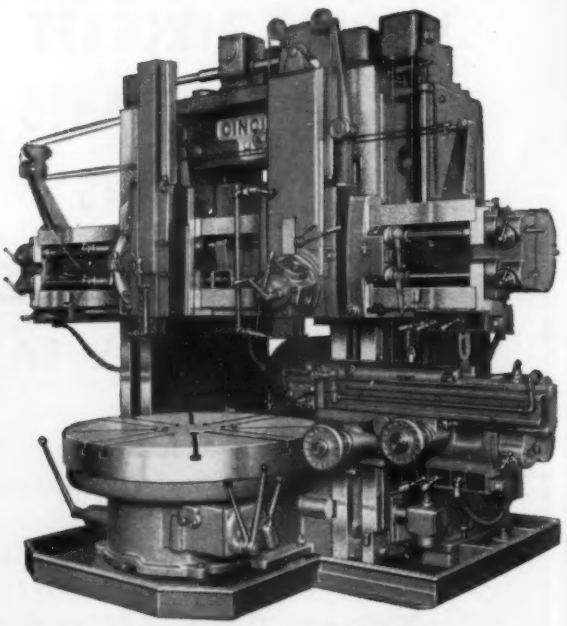
120" HYPRO DOUBLE HOUSING PLANER



72" HYPRO OPEN SIDE PLANER



HYPRO COMBINATION PLANING & MILLING MACHINE



54" HYPRO VERTICAL BORING MILL

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

have landed . . .

Mr. Business Executive, you are a four-star general when this war ends. It is up to you to have the jobs for our boys, then. They have fought and will have won this war . . . but with "cease firing" they will look to you for their peacetime commands. Will you be ready? Is your plant and your sales organization ready to absorb the shock of rightful invasion by the returning hordes of Americans? Nine million American men and women returning to the civilian way of life! Think ahead, Mr. Business Executive, to the time when you again will have to make the decisions and give the orders. When the sales battle is once again how to whip competition. When markets are measured in customers rather than in government contracts. When production at any cost becomes production at lowest cost. To turn a profit, then, we suggest you turn to LeBlond now . . . it's time to retool for "peacework".

THE R.K. LeBLOND MACHINE TOOL CO., CINCINNATI, 8

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CHICAGO 6, 20 N. Wacker Dr. STA 5561

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- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
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- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

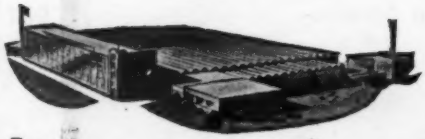
time to retool

Turn to LeBlond for Turning Equipment

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

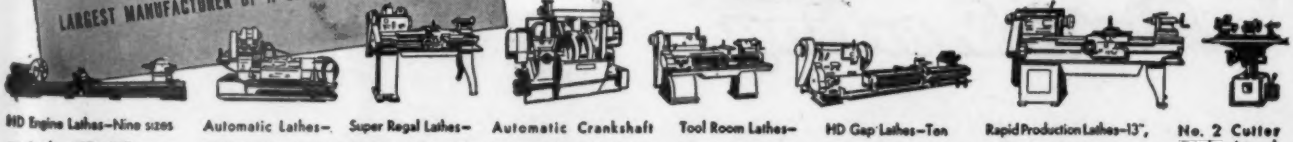
ARMY E NAVY

LEBLOND



YOUR BONDS BUY BOMBS

BUY A "BLOCK-BUSTER" TODAY!



HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.

Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

1,000,000 WITH STEEL
X 10
10,000,000 WITH FIRTHITE®

MULTIPLIES DIE LIFE AND PUNCH LIFE BY 10!

FIRTHITE Lamination Dies have blanked, on one grinding, more pieces than an alloy tool-steel die punched in its entire "life." (On this operation a good steel die produces about a million pieces.) This Firthite Die has produced, with only a few honings, over ten million pieces and may be good for as many more.

Firthite Dies retain their original sharpness much longer than any steel dies. They cut clean and free—reduce burring, distortion, dimpling, and buckling. Firthite Dies also resist chipping or breaking, even in case of a miscut. They are superior for notching as well as blanking. A Firthite Engineer will gladly give you details.

ARMY NAVY

Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA
CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

ARMSTRONG

Tool-up NOW . . .

For Greater War Production . . . and Be Tooled-up for Post-War Competition

Equip every lathe, planer, slotter and shaper with a complete set of ARMSTRONG TOOL HOLDERS — with the correct types and sizes for every operation. While the extra strength and ready adaptability of ARMSTRONG TOOL HOLDERS make it possible to "get by" with a minimum of types and sizes, the correct ARMSTRONG TOOL HOLDERS will permit greatly increased production on each operation — will permit speed and feeds often double so-called "Standard" speeds and feeds, without loss of cutting efficiency.

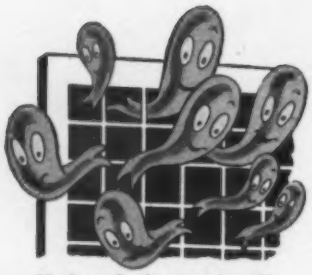
Tool-up completely now with ARMSTRONG TOOL HOLDERS to increase your War Production and you will also be tooled-up for post-war competition, because each ARMSTRONG TOOL HOLDER is a permanent, multi-purpose tool that will not only outlast the war, but with the change of a cutter, will be ready to start on post-war production.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. FRANCISCO AVE., CHICAGO, U. S. A.
Eastern Warehouse and Sales:
199 Lafayette Street, New York

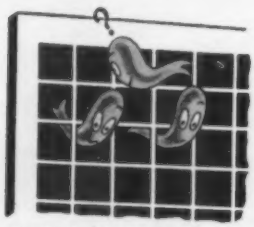
ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

HOW *PRECIPITRON*★ WORKS

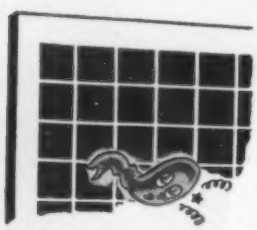
You get 90% CLEANER Air with ELECTRIC Air Cleaning



Uncleaned air contains dirt particles of various sizes.



Mechanical cleaners permit small particles, or about 10% of the dirt, to "escape."

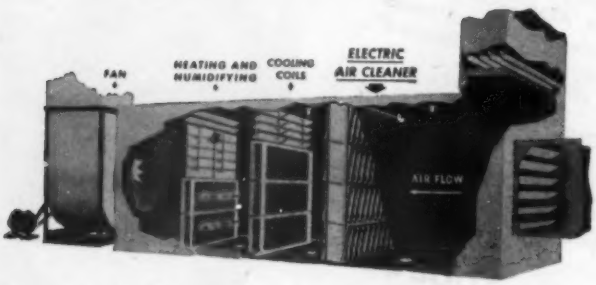


Precipitron removes the *small* particles, too; is 99½% efficient (based on weight tests).

Yes . . . 90% *cleaner* air than is provided by conventional air cleaners. For each ounce of dirt that "escapes" in a mechanical air cleaner, *less than 1/10 of an ounce* gets through the Precipitron. The reason for this is that the Precipitron, operating electrostatically, removes air-borne particles as small as 1/250,000ths of an inch in diameter.

Sealed within the ventilating duct so that all air must pass through it, the Precipitron operates silently, efficiently, with no more moving parts than a storage battery. At the front of the unit (or cell), two fine tungsten wires and three grounded rods create a strong electrostatic field. As each particle of dirt passes through this field, it receives a positive charge of electricity.

These charged particles are then carried by the air stream to *collector plates* located behind the electrostatic field. Here the dirt particles are quickly "grounded" on the oppositely charged plates. And here they stay . . . until the plates are washed down with water and the deposit flushed harmlessly down the drain.



Cross section of Precipitron installation in typical air conditioning duct.

Because Precipitron consistently removes more than 99½% of ALL air-borne dirt (measured by weight), it has given a new meaning to commercial and industrial air cleaning. For full information on Precipitron and its applications . . . for immediate use in vital war production . . . or postwar use in other fields . . . write Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio.

*Trade-mark registered in U. S. A.

Westinghouse Precipitron

PLANTS IN 25 CITIES ○ OFFICES EVERYWHERE

Tune in on John Charles Thomas, NBC, Sundays, 2:30 p.m., E.W.T.

Electronics at Work

"PUT IT ON THE BLANCHARD"

Grinding Main Housing Poles for Magnetos on a No. 18 Blanchard Surface Grinder

Ability to remove metal quickly and cheaply makes it possible for Blanchard Grinding to carry through from roughing to finishing in one operation.

These Housing Poles for magnetos have .140" stock to remove from steel laminations. Ten pieces are held on a Blanchard designed fixture on the No. 18 Grinder and 30 pieces are finished per hour.

The weight and rigidity of the Blanchard are essential for economical machining of parts such as these.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ Production
- ★ Adaptability
- Fixture Saving
- ★ Operation Saving
- Material Saving
- Fine Finish
- Flatness
- Close Limits

★ . . . . *Especially valuable on jobs like the one illustrated.*

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASSACHUSETTS

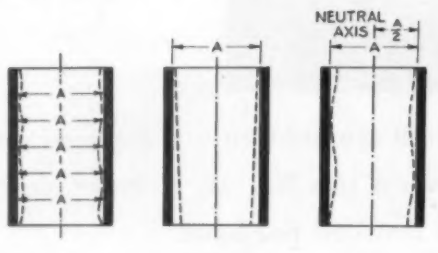
BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

MICROMATIC offers you
THE HYDROHONER

Accuracy, Uniform Size
Stock Removal
Controlled Surface Finish

THE HONING PROCESS



Diametric Roundness

GENERATES
Diametric Straightness

Axial Straightness

CORRECTS
Taper

Out-of-roundness

Axial Distortion

Micromatic Hydrohoner—
With Automatic Microsize . . .
Precision Hones to uniform size.
Machine stops when correct size is reached.

Micromatic Honing is a process for finish machining cylindrical surfaces—internal or external by means of controlled abrasion.

Abrasive sticks positively expanded by the hone, are rotated in contact with the work and are given one or more reciprocating motions at the same time—all actuated under extremely low speeds and pressures.

Stock is removed at rates up to .001″ per minute on diameter—to more than 1 cubic inch per minute in volume on hard, forged steel.

Roundness is generated—out-of-roundness is corrected within tolerances as low as .0001″ in many applications. Taper is corrected and diametric and axial straightness is generated by stones long enough to overcome deformity.

Uniform size is generated in high production to tolerances as low as .0005″.

Microhoned surface finish may be controlled to any degree—from matte (grey) to mirror (black).

Micromatic
HONE CORPORATION
Detroit 4, Michigan

MAKERS OF HONING MACHINE TOOLS

a New VERTICAL HYDROHONER

A High Production Vertical Type Hydrohoner

Diameter of Work . . . ⅛" to 2".

Spline Driven Head Reciprocating Stroke . . . 15".

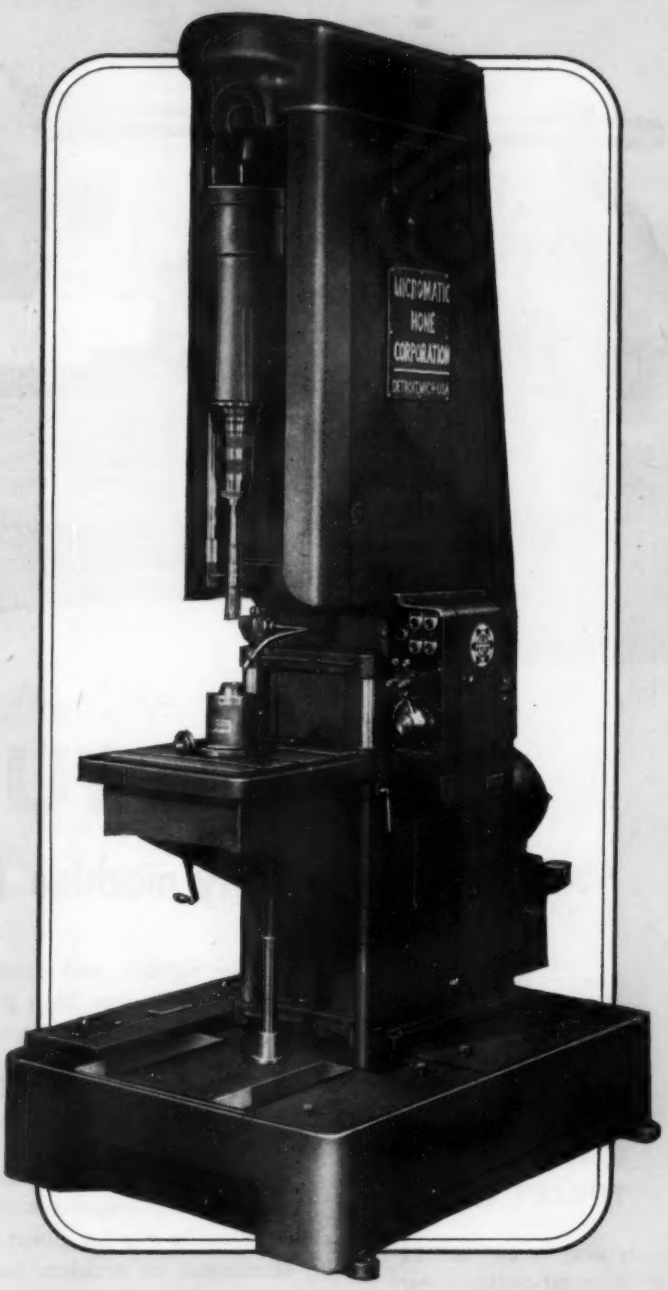
Spindle Oscillating Stroke . . . 0 to ⅛".

Centralized Hydraulic Operating Control. Panel provides easy operation—fast production. Hydraulic tool expansion assures uniform pressure and cutting rates for fast precision work.

Other features are—hydraulic timer—full ventilated hydraulic oil tank of 60-gallon capacity mounted in base.

Also available with 3-speed transmission, rising screw table, electric timer, special coolant filter, and special coolant refrigeration.

Available for normal prompt delivery.

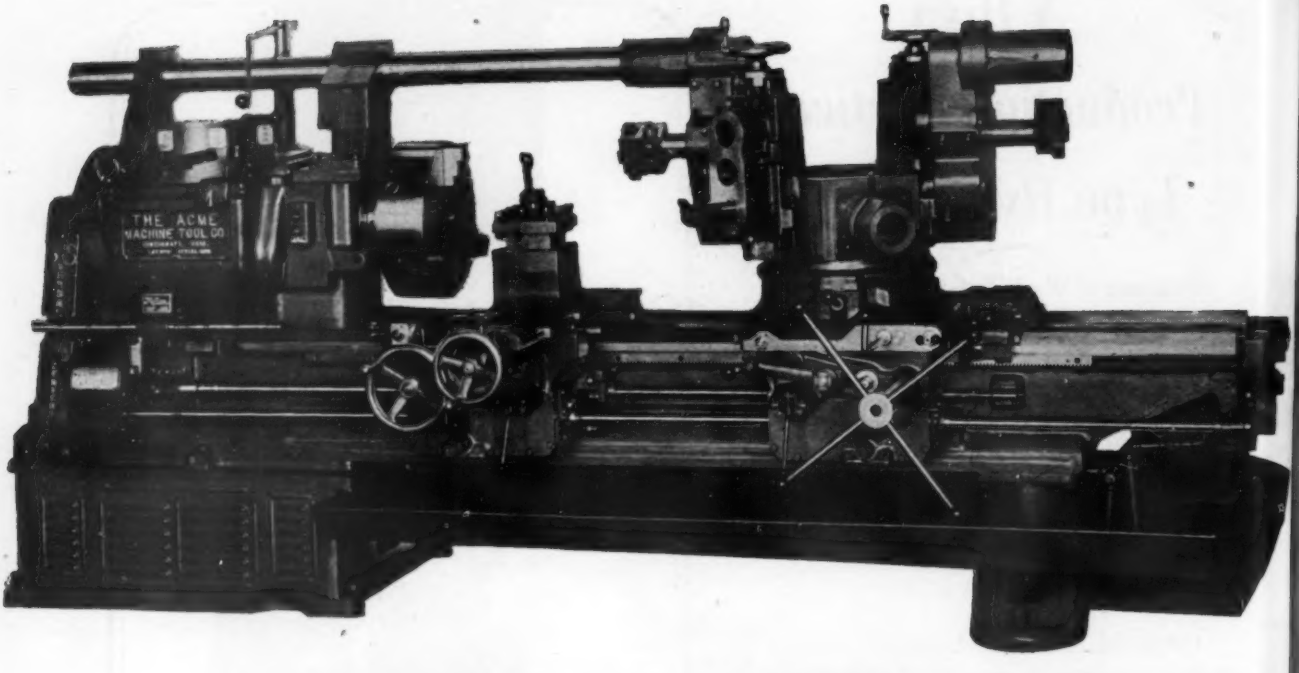


MICRO MATIC

Micromatic HONE CORPORATION

DETROIT 4, MICHIGAN

THE 3-S



ACME TURRET LATHE

A heavy duty machine for heavy duty precision work

THE 3S
ACME
TURRET LATHE

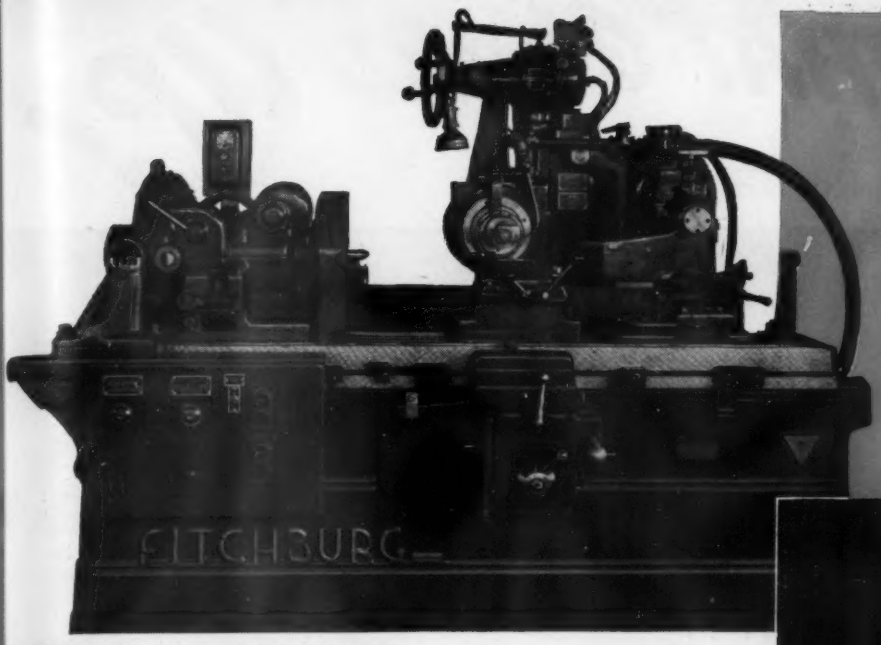
Is built in 24" and 28" swing for chucking work and up to 4 1/16" diameter bar capacity.

• **The rigidity and massive design provides ample support to carbide and other high production tools and assures both the precision and productivity required under today's conditions.**

This heavy duty Acme Turret Lathe is adaptable to a wide range of heavy duty tools of both standard and special design.

It also features a stationary overhead pilot bar which not only makes for increased accuracy but speeds up jobs requiring exceptionally rigid support to the cutting tools. This pilot bar design eliminates an accident hazard as there is no overhanging bar projecting from turret to swing around and get in the way of the operator.

ACME MACHINE TOOL CO.. ... CINCINNATI. OHIO.



This book shows how to cut grinding costs . . . Sent free . . . write for it today.

SPLINE GRINDING?
SPLINE SHAPING?
INTERNAL GEAR GRINDING?
EXTERNAL GEAR GRINDING?

.... Do all four on the Fitchburg Gear Grinder

A single Fitchburg Gear Grinder, with special attachments will

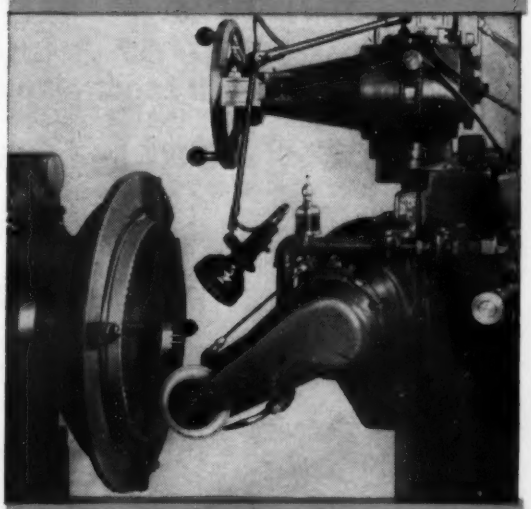
GRIND internal or external, helical or spur gears — straight, taper and helical splines, and will also

SHAPE straight, taper and helical splines.

A leading automobile manufacturing plant now engaged in making airplane engines, is using Fitchburg Gear Grinders with Special Wheelheads in the important operation of grinding internal gears. They give highest praise to its accuracy, fine finish and high production at low cost.

You can get the same results on a variety of work—on this one machine—why not let Fitchburg engineers show you how. Write today.

Spline Shaper Attachment



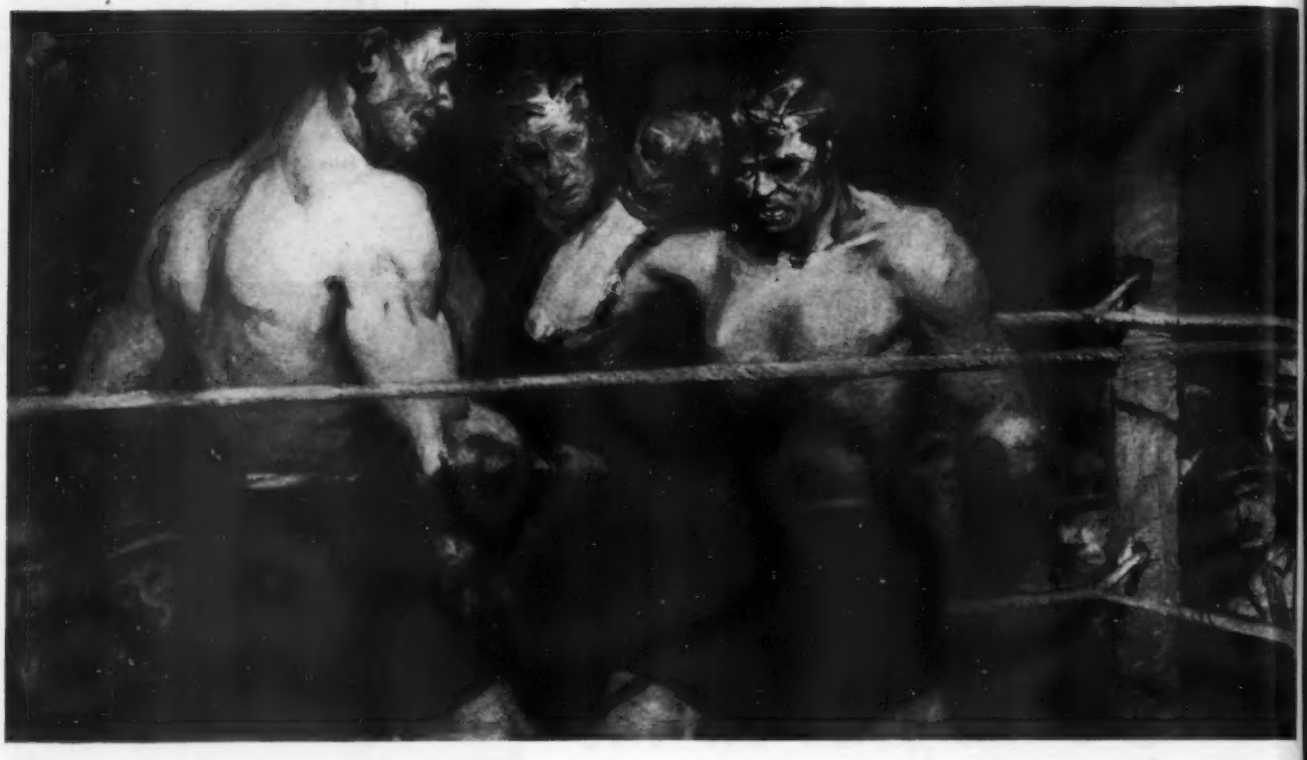
Internal Gear Grinding Attachment

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

-KEEP THAT GUARD UP!



It is not all over but the shouting. * We can still—lose. * Ships are yet to be launched that will win the war. Planes are yet to be built that will win the war. Bonds are yet to be bought that will win the war. * Keep that guard UP, America! This fight isn't over, yet. And a referee's decision won't do. We've just got to win... by a knockout.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

P&J

had completed "basic training" long before "December 7th"

Away back, 40 and more years before Pearl Harbor, the P & J organization began its pioneering work in the design and development of Automatic Chucking Equipment. Thus when war broke in the Pacific, P & J had long since passed through its basic training period and was qualified for its commission in the metal working industry's army of production.

P & J has been doing a war-time job in a war-time way ever since the start of hostilities. Duplicate parts — for airplanes, airplane engines, tanks, guns, shell adaptors and a host of other war materiel are being turned out at maximum speed and accuracy on fast, convenient, man-power-conserving P & J machines. The experience thus gained and being applied to present-day needs will be of invaluable help when production turns again to peacetime requirements. Call on P & J to help you solve your immediate problems.

***The* POTTER & JOHNSTON MACHINE COMPANY**

Pawtucket, R. I.

PHOTO BY U.S. ARMY SIGNAL CORPS

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

BUY MORE of them...or risk wearing them....

TOOLS WORK TWO EXTRA SHIFTS PER WEEK

SUNOCO
EMULSIFYING CUTTING OIL

increases tool life 35% . . . improves finish . . . at war plant

Machine tool men looking for ways to effect tool economies will find this case history valuable. It's about a plant producing armament parts, and how they increased tool life the equivalent of two extra 8-hour shifts in every 48-hour week.

Production was slowed because of trouble on machines using a competitive soluble cutting oil. Tool casualties ran high, finish of parts was inferior, emulsions showed a tendency toward rancidity.

Trouble stopped when they changed to Sunoco Emulsifying Cutting Oil upon the advice of a Sun Oil Engineer. Tool life increased 35% . . . finish was noticeably finer . . . rancidity stopped. And in addition, cutting oil costs were cut.

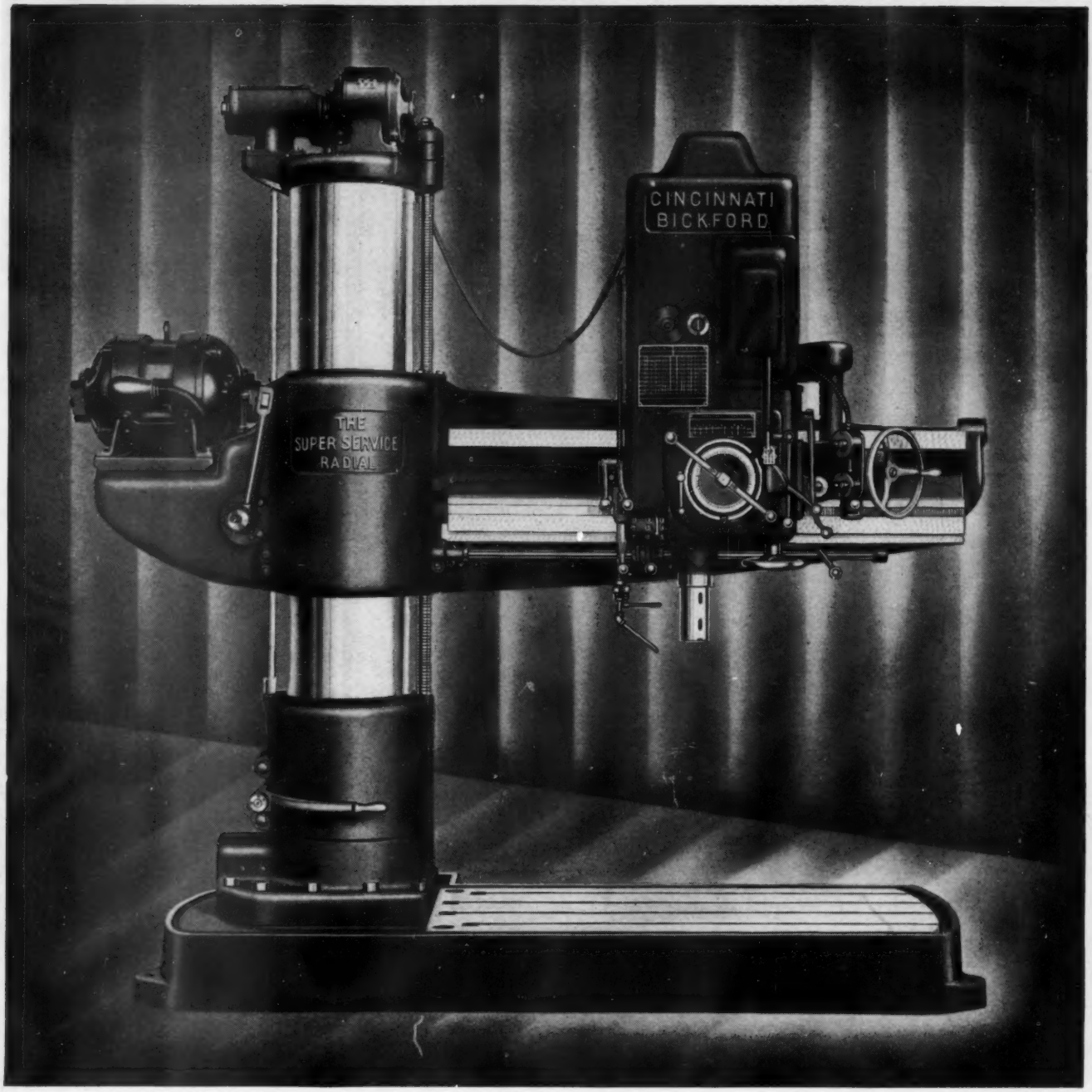
Now parts are speeded from the machines of this plant . . . and from hundreds of other plants that have found Sunoco Emulsifying Cutting Oil a spur to machine tool output. Sunoco's exceptional heat-absorbing quality and stability make it the answer for all metal cutting operations where a soluble oil is used.

For advice on cutting oil problems, write

SUN OIL COMPANY · ***Philadelphia 3, Pa.***
Sun Oil Company, Ltd., Toronto, Canada

SUNOCO

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERICA*



LARGE jobs ••• — SMALL machines ••• BIG time savers ••• — LITTLE overhead

In other words, drilling efficiency is the result of the Cincinnati Bickford Tool Company's exclusive specialization, for over a half a century, in Radials and Uprights.

The Super Service Radials are available in sizes from 3 to 8 foot arms and the Super Service Uprights in 21", 24" and 28" sizes.

For further information on standard or special metal drilling machinery adaptable to your requirements write us today.

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY • CINCINNATI 9 • OHIO • U. S. A.

Why every company has an obligation to make post-war plans now

SOME people think post-war planning now is somehow unpatriotic, premature, the wrong use of time.

The government doesn't think so. They are working on demobilization plans, conversion to peace, and yet not letting it interfere with prosecution of the war. Everyone can and should do the same, because . . .

What sort of welcome will it be for our soldiers if they come home to closed factories, with "No Help Wanted" signs —factories shut down while they're being converted to peacetime products?

As part of its post-war program, every factory should plan on providing as many good jobs as possible for efficient workmen. To provide good jobs, a factory will have to compete successfully in the peacetime world. To compete successfully means you must provide goods at a cost low enough to attract buyers. To keep your costs that low means you must provide your workmen with every possible means of eliminating waste and keeping down cost-per-piece. And that means the most efficient machine tools possible.

Plan now, and set aside the dollars, for the new Warner & Swasey Turret Lathes and other machine tools you'll need to keep your post-war costs low. Modern Warner & Swaseys can cut turning costs as much as 50% below many old-time rates. That means broader markets for your goods; and *that* means you'll provide more post-war jobs. Right there is reason enough to do your post-war planning *now.*

YOU CAN TURN IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

WARNER & SWASEY
Turret Lathes
Cleveland

What's In This Issue

Glass Gage Grinding

Glass gages differ from metal ones in usage and production. During the year elapsed since they were brought into use to save metal and lessen pressure on their manufacturers, research has determined the proper means of molding, grinding and lapping them to maintain close tolerances. On page 83 is an article detailing the findings of researchers in the laboratories of the T. C. Wheaton Company, glass manufacturers.

Scraping Bottom

Germany is rapidly emptying her barrel of ersatz, say Allied ordnance experts, who have consistently subjected captured equipment to searching scrutiny. Their findings make it possible to trace the decline of the Reich's raw materials, manpower and machine tool output. Their conclusions are told in an article awaiting you on page 115; it's a report not designed to give comfort to the enemy.

Bonds for War and Peace

One of the newest, and most closely guarded, methods of bonding materials together is that of Cycle-Welding, which can permanently join metal, wood, rubber, plastic or ceramics, in any combination. A Chrysler peacetime development which has found valuable application in the construction of war planes, Cycle-Welding is cutting assembly time and labor, and saving vital material. It's important information to planners of both war and postwar products, and a detailed exposition opens on page 105.

It Can do More Than Weld

Resistance welding equipment isn't limited to the use for which it was originally designed, we learn from the seventh article in a series by R. T. Gillette and J. F. Young of the General Electric Company. With the aid of properly designed equipment, resistance welding equipment's "spare-time" uses vary from burning holes in hardened steel to annealing tubing, wire and structural shapes. This, and other valuable facts about resistance welding make up the article originating on page 94.

JOSEPH SAMMON

Fixtures Are Important

Like the oft-cited chain which determines its maximum strength by that of its weakest link, quality of heat-treating output can be influenced by proper design of fixtures. An article by Joseph Sammon, chief foundry engineer, The Driver-Harris Company, commences on page 88, describes and illustrates the latest fixtures for heat-treating various parts.

Calculating Cutting Faces

Trigonometric tables of cotangents and cosecants are used by firm's designing room for the rapid determination of the relation of the cutting faces of circular forming tools to the center of the tool. The procedure used is detailed in text matter and charts in the Reference Book Section, page 117.

Postwar Machine Tool Demand

Contrary to the opinions of a few pessimists the market for machine tools after the war looks good. Automotive demand alone may come to $250,000,000 or better.—A news article on page 20e sums up the situation.

Gently but Firmly

Faced with the necessity of clamping a large irregular casting into position firmly, but without distortion due to excessive pressure, Warner & Swasey Company developed a large boring fixture and clamping frame. Turn to page 87 for the information on its use.

Threading Accuracy

Accurate construction of thread lobes on cams for Brown & Sharpe automatic screw machines is possible when threading dies or chasers are properly applied, explains A. Ainsworth of The McKinnon Industries, in an article on page 91. He gives five methods of figuring thread lobe rise.

Plastic Spools

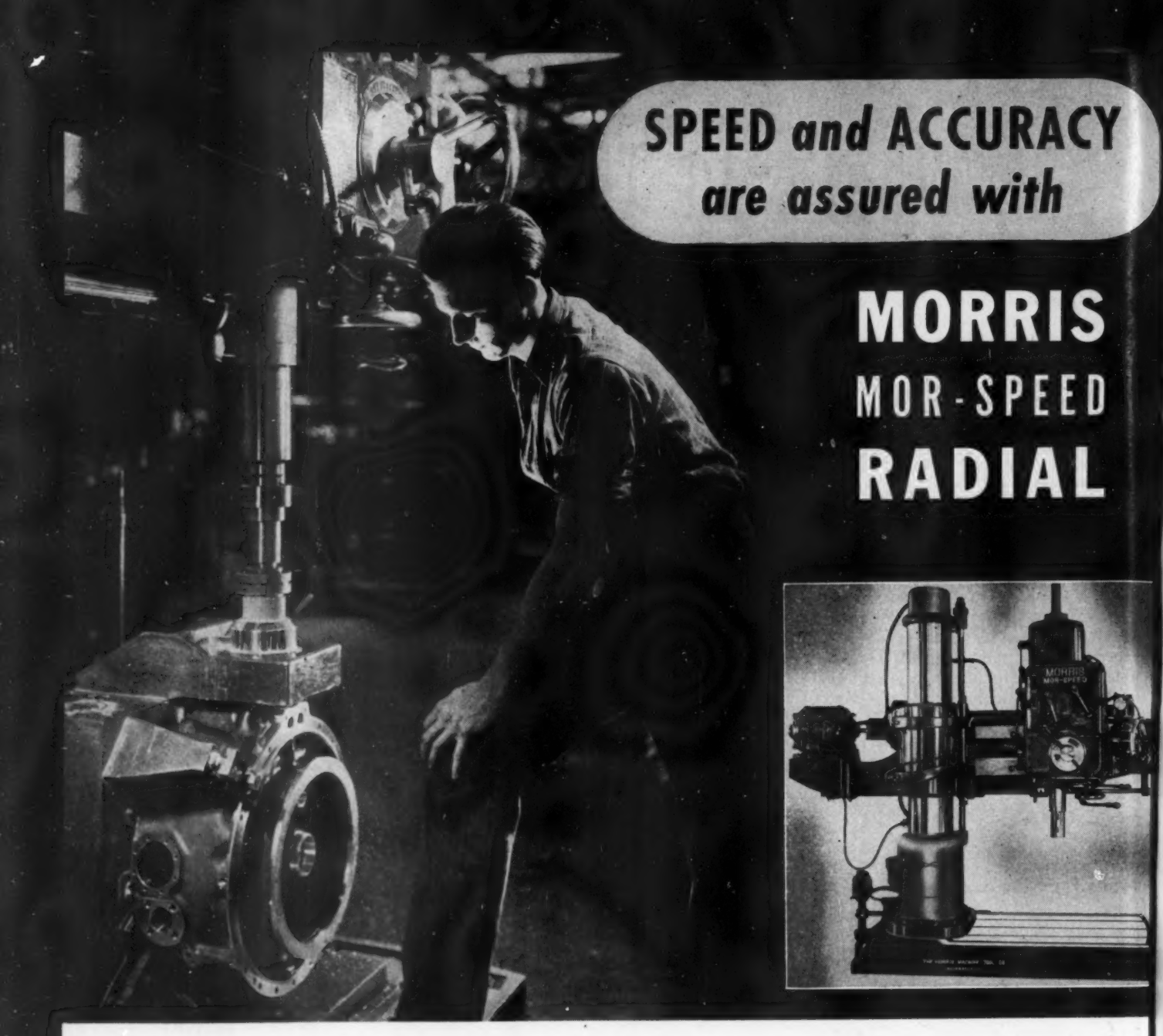
Dr. Paul G. Weiller, Kollsman Instrument Division, Square D Company, ran into the problem of holding Bakelite spools to close tolerances. A solution was found in wet grinding these parts. When suitable fixtures were designed and this process used it was possible to hold dimensions within 0.005. Page 97.

COMING

Next on the program is the Annual Review Number which is scheduled for publication on January 20. Between its covers you'll find collected data and illustrations of the newest types of equipment, materials, tools and processes developed in the metal-working industry during the past year and published in the 1943 pages of American Machinist. Like preceding Annual Review numbers, the coming issue will occupy an important place among the ready-reference books of busy executives.

To protect an invention the more completely and with a minimum of difficulty, an engineer should comprehend the attitude of the patent office and the courts, and know what constitutes a good patent. Armed with this knowledge, he is better prepared to lay the groundwork for, and aid to a successful termination, the complete protection of his brain child. Beginning in an early issue, a series of articles by A. Boyajian of the General Electric Company will present this intricate subject in an informal, clear fashion.

When the RAF cascades thundering salvos of bombs on Berlin, it's a safe bet that many a bombardier uses a bombsight produced at Flint by the AC Spark Plug Division of General Motors, where thousands of these T-1 computors have been mass produced. Soon we will give you an analysis of the assembly methods employed.



SPEED and ACCURACY are assured with

MORRIS MOR-SPEED RADIAL

● This intimate view of a Morris Radial at work emphasizes the ease with which precision boring or reaming operations may be performed on a Mor-Speed Radial.

All controls for feeds — speeds — head traverse, etc. are located on the head within easy reach of the operator. And the rigidity of construction plus ample power for high speeds and heavy feeds assures dependable accuracy and maximum production.

The machine shown is operating in one of America's foremost aircraft engine plants. Likewise in machine shops—shipyards—and on the ships themselves Morris Mor-Speed Radials are doing their part to bring this war to a victorious conclusion.

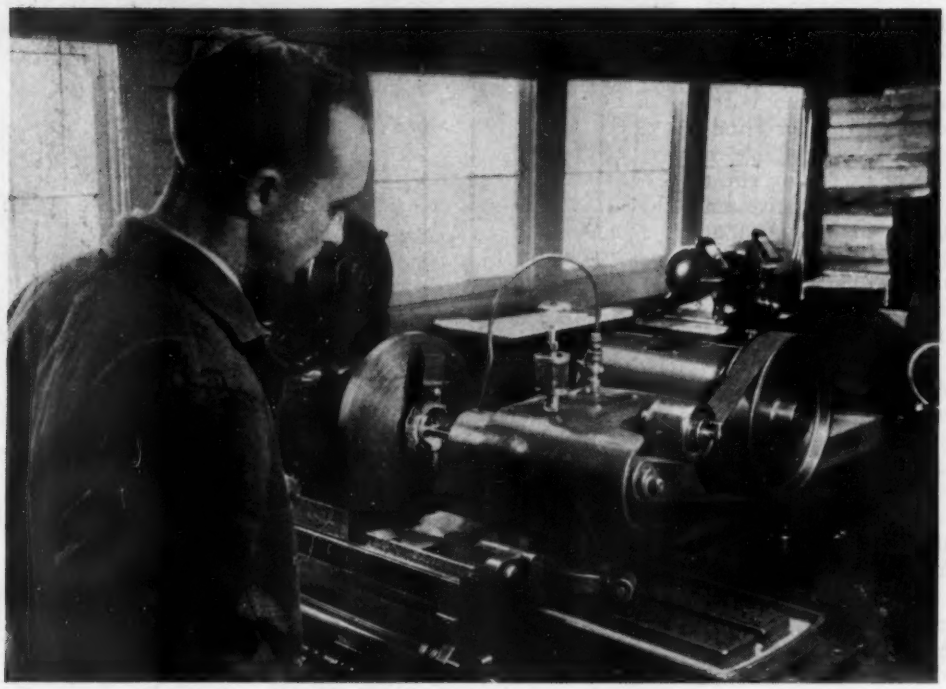
Put you next radial job on a Morris

Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI, OHIO

American Machinist
ESTABLISHED 1877 • BURNHAM FINNEY, EDITOR



Although four-jaw chucks can be used to hold ring gages for internal grinding, the fixture shown here is recommended. These gages can be ground to a finish of 1.5 micro-inches. They are lapped to final size

Grinding Procedures Set for Glass Gages

PRECISION GAGES made of glass sprang into prominence a year ago. Advocated advantages included a saving in tool steel, greater visibility during inspection, non-corrosiveness, lack of a tendency to seize or gall on steel, good abrasion resistance, and non-deformation if dropped. Thousands of gages were made and placed in service with some good results, and some bad. It now appears that glass gages when designed properly for selected applications, depending on the metals to be gaged and the tolerances checked, will give satisfactory results. They have been used successfully on brass and steel, but with discouraging results on aluminum.

Research on the molding, grinding and lapping of glass gages has been

Close tolerances and transparent finishes on these gages require deviations from usual grinding practices. They are recommended only after feasible applications have been set up for each gage

conducted by the T. C. Wheaton Company, glass manufacturers, in conjunction with the Frankford Arsenal Gage Laboratory. It has been found that when a feasible application for a glass gage has been established, it can be produced to the specific tolerances, providing all the factors concerning the grinding of glass are well understood.

Glass being noncrystalline material grinds differently than steel, and the action of the wheel is literally a breaking off of microscopic particles. These particles must be prevented from circulating with the coolant, since they will scratch the surface of the gage being ground; therefore, the grinding machine must be equipped with a filter capable of removing them. It is recommended that the coolant be filtered further through ten to twelve layers of fine cheesecloth tied around the pipe directing the coolant on the gage.

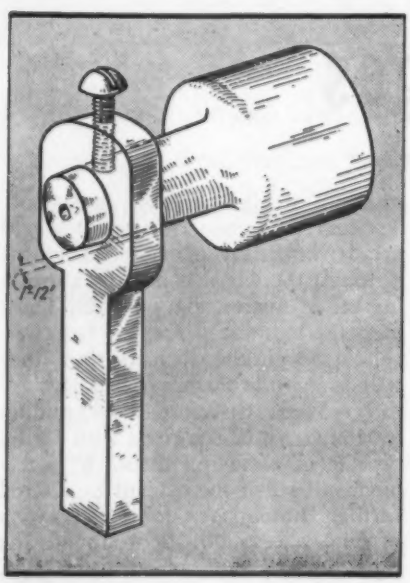
An abundant supply of coolant is advocated. The work and wheel must be kept cool to prevent the glass from spalling and cracking, which results in skin stresses that will shatter the

glass under light impact. Sparking or firing of the glass is evidence of this action, and when coolant supply is not sufficient to stop it, the speed of the wheel should be decreased. Normal wheel speed is 6,000 surface ft. per min., but this may be lowered to 4,500 ft. per min. or slower, if necessary to stop sparking.

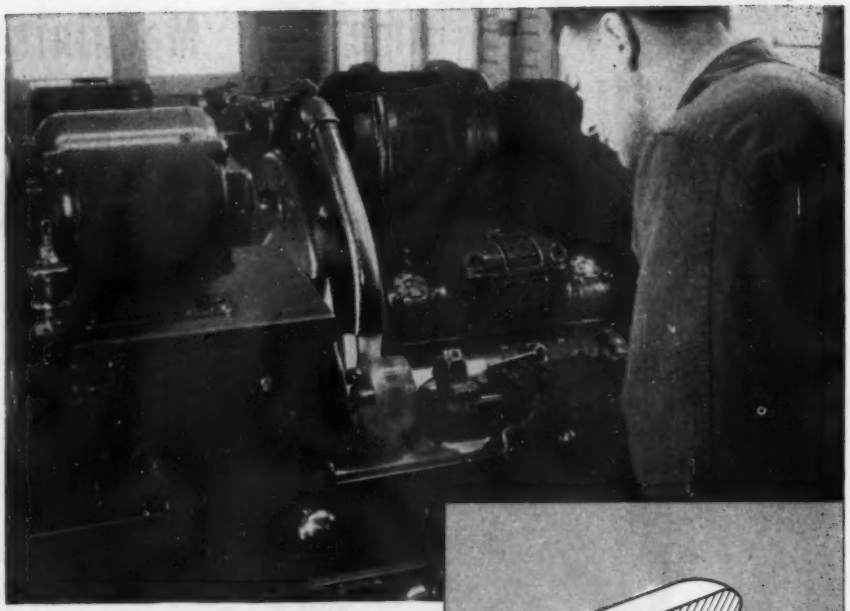
It has been found that plain water is the most effective coolant for grinding glass. When it is not desirable to use water, because of its rusting effect on the machine, a rust preventative can be used in water or in a light solution of sal soda. Soluble oil in the ratio of 1 part oil to 25 parts water can be used, but is not as effective as water, since the main function of the coolant is to eliminate sparking or firing.

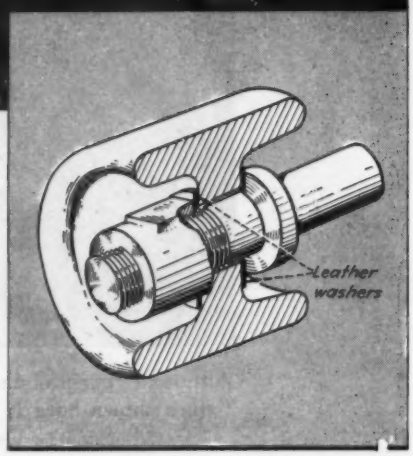
The finish and accuracy obtained simply by grinding is satisfactory for average accuracy requirements of glass gages. However, to produce straight cylindrical gaging surfaces free of scratches and taper, grinding must be done with a minimum of vibration on a rigid precision-built grinding machine. When necessary to produce gages of extreme accuracy, lapping must follow the grinding operation.

Two operations—rough and finish grinding—are recommended to produce glass gages of high accuracy and transparency. Soft vitrified silicon-carbide wheels of 100 grit size, (A.S.A. C100 S7 7 V) have been found best for rough grinding, while soft shellac-bonded silicon-carbide wheels of 500 grit size, (A.S.A. C500 S7 9 E) have been found best for finish grinding.



Standard grinding dogs exert excessive pressure on taper-lock gages, and causes breakage. This dog, made of light metal, eliminated the trouble





Tri-lock plug gages are mounted on a mandrel for chucking between centers. The glass must be protected by soft washers to prevent cracking

Centers are drilled in the ends of plug gages for mounting between centers on a cylindrical grinder. The holes are drilled satisfactorily with a tungsten-carbide triangular drill, and countersunk with the same material. The center holes are then finished with a diamond lap. Silicon-carbide lapping sticks were used prior to the diamond lap, but they developed grooves rapidly, making it difficult to obtain identical centers on successive gages coming from the machine. Requests have been made to mold the centers in the blanks, but this is impractical in glass-molding procedure.

Use Live Footstock Center

When a dead footstock center is used while grinding, white or red lead mixed with machine oil has been found to be the best lubricant. However, tests have proved that extensive grinding on glass will score high-speed steel centers because of the abrasive action in the center holes; therefore, live centers in both the headstock and footstock are advocated. Excessive footstock pressures will cause plug gages to break while being ground. This can be eliminated by replacing the standard stiff coil spring in the footstock with a weaker one.

Breakage has also been encountered when using the standard grinder dogs on solid and taper-lock plug gages. This was remedied by designing a dog that applied less center pressure on the gages. This dog, made from a light piece of scrap iron, is shown in one of the drawings.

During the grinding of plug gages, excellent results have been obtained using an 18 in. diameter wheel running at 4,600 surface ft. per min., and rotating 1 in. diameter gages at 226 r.p.m. During rough grinding, 0.060 in. stock was removed from the gage in 1 min. by plunge cutting, including time for grinding and sparking out. About 0.001 in. was left for the finish grind, this being removed in about 2 min. A clear transparent finish was obtained by cutting off the coolant during the last few revolutions of the sparking out period.

To obtain a clear surface finish giving a Profilometer reading of 1½ to 2 micro-inches, it was necessary to use a flat or blunt diamond for dressing the grinding wheel face, especially at the slow speed of 4,600 surface ft. per min. It has been found that a glazed wheel face contributed appreciably toward a successful finish grinding operation. This was accomplished by grinding lightly on a piece of steel hardened to Rockwell 50C for a few minutes. This produced a smooth and shiny finish on the 500-grit shellac-bonded silicon-carbide wheel, which glazed condition apparently retarded the cutting action.

Grinding full radii on the end of plug gages is not recommended. It is for that reason that there is a multiplicity of glass plug gage blank sizes available. When such a radius is not ground, the gage will stand more abuse because the skin hardness on the outside of the glass, caused by contact with the cast-iron mold when the gage was made, will not be disturbed. However, there must be no sharp corners between the ground portion of the gage and the end radius; otherwise, the gage will chip or spall in service. The radii on the ends of the gage can be blended with the ground gaging surface by forming radii on a 2 in. wide grinding wheel, using a radial truing device. When this is done, a multistop index ring should be used on the wheel feed index wheel, so that the operator can maintain close relation between the outside diameter of the gage and the bottom of the end radius.

Close diametrical tolerances can be more easily maintained on the gage diameter if an indicator graduated in 0.0001 in. is attached to the footstock of the grinder so that the pointer will come in contact with some finished part of the wheel slide when it is grinding position.

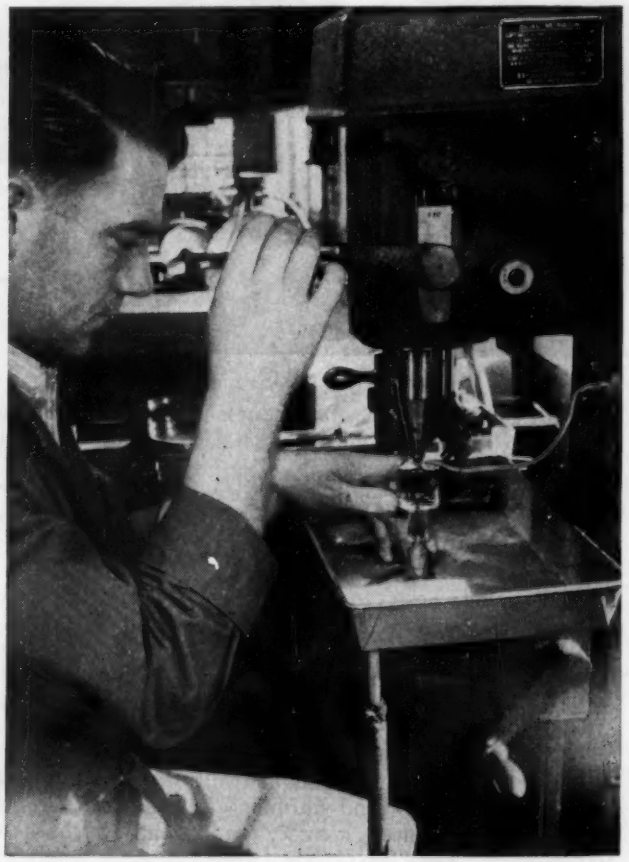
TYPICAL DATA ON 1-IN. RING GAGE

	Rough grinding	Finish grinding
Wheel:		
Size	¾x¾x¼ in.	¾x¾x¼ in.
Abrasive	Silicon-carbide	Silicon carbide
Grit size	100	500
Bond	Vitrified	Shellac
Grade	Soft	Soft
Wheel speed	12,000 r.p.m.	12,000 r.p.m.
Dressing tool	Diamond	Diamond and glazed with hard steel
Work speed	225 r.p.m.	225 r.p.m.
Table traverse	50 in. per min.	20 in. per min.
Feed per pass	0.0005 in.	0.0002 in.
Total feed	0.0300 in.	0.005 in.
Finish	6-8 micro-in.	1-1½ micro-in.

Tri-lock plug gages can be mounted on an arbor for grinding. The type of arbor found most practical is shown in one of the drawings. It is important that paper, fiber or leather washers be inserted on the arbor adjacent to the glass and between the arbor washer and nut. When this precaution is not observed, microscopic fractures will occur that propagate when the gage is in service, resulting in ultimate breakage. Grinding practice is the same as for solid and taper-lock gages.

It can be reported that diamond bonded wheels have been tried for grinding glass gages. A 100 diamond grit metal-bonded wheel was used successfully for rough grinding a 1 in. plug gage at a work speed of 226 r.p.m., removing 0.035 in. stock in 25

Center holes in solid and taper-lock plug gages are drilled and countersunk with triangular tungsten-carbide tools. Water is the coolant



Center holes in plug gages are finished with a diamond lap, with water as the coolant. Silicon-carbide lapping sticks were tried unsuccessfully

Ring gages honed on this machine have been checked for straightness and roundness within 0.00005 in. The honing oil was diluted with three parts of kerosene

Plug gages are checked for size and roundness in this Sheffield Electrichek gage. Grinding wheels are purposely glazed to produce the transparent finish

sec. with a maximum out-of-roundness of 0.00075 in. Similarly good results were obtained when grinding ¾ in. and ½ in. plug gages with this wheel. In all cases, 0.005 in. stock was left for finish grinding. A 200 diamond grit resinoid wheel was used for the finishing grind; however, the best results obtained showed distinct chatter marks, and this type of wheel was not considered any further for the grinding of glass gages.

Ring Gages Are Ground and Lapped

Ring gages are also ground in two operations—roughing and finishing—to obtain the desired accuracy and transparency. Data previously given for coolants and types of wheels for grinding plug gages also apply to ring gages. However, the grinding wheel should be as large as consistent with the work hole size. For example, a ⅞ in. wheel will produce better results when grinding a 1 in. hole than will a smaller wheel. The spindle on the wheel head should be as large as possible for rigidity. For rough grinding, the wheel should be trued and dressed with a diamond tool. For finish grinding, the diamond is traversed at a slow rate, and the wheel then glazed with a piece of hard steel.

Ring gage blanks of latest design have heavy serrations around the periphery. These prevent glass gages from slipping from inspector's hands. The gages can be held in a conventional four-jaw chuck for internal grinding; however, special fixtures with nests for the serrations and having side clamps, as shown in one of the illustrations, tend to minimize danger from microscopic cracks that may not show up until after the gage is in service. Slight abuse of the gage may then result in breakage.

Data on grinding a typical ring gage are given in the table.

A Sunnen honing machine has been used successfully for finishing ring gage diameters to close tolerances. The mandrel speed is usually 250 r.p.m. Glass can be removed at the rate of approximately 0.004 to 0.005 in. per min. with stones which leave from 0.0005 to 0.001 in. for finish honing. The first 0.0005 in. can be removed in about 1 min., and as the surface gets smoother, this will slow to about 0.0002 in. per min. Holes honed on this machine have been checked with a Swedish indicator reading 0.0001 in., and as closely as they can be checked, they have been found straight and round within less than 0.00005 in. A steady flow of lubricant is pumped on the hone to wash away chips and to keep the gage from heating. Houghton MM honing agent, diluted with three parts kerosene, has proved effective on this operation.

Expanding laps of zinc and pewter have also been used. By mounting the ground gage in the chuck of a high-speed lathe and using this expanding lap, these gages may be finished to relatively close tolerances. A mixture of optical flour and light machine oil is recommended. The final transparent finish can be imparted with a hard felt lap saturated with a mixture of rouge and water.

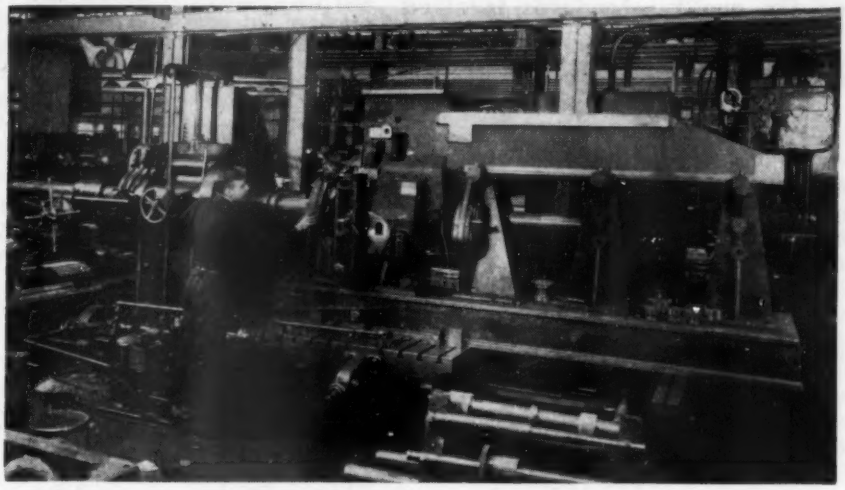
Good, fair and poor reports have been received from companies using glass gages. It has been noted that where the tolerance is liberal, the more favorable the report; therefore, glass makers recommend glass gages where tolerances are generous.

There are certain characteristics in a glass gage that require certain precautions in its use. An instance is the necessary radius on the end of the gage in place of the angular chamfer or sharp edge on the steel gage. If large radii are not used, the particles of glass break off and act as an abrasive between the two surfaces and produce scratches. Fine glass particles become dislodged from the scratches, enter the subsequent cavities, and thus supply additional abrasive.

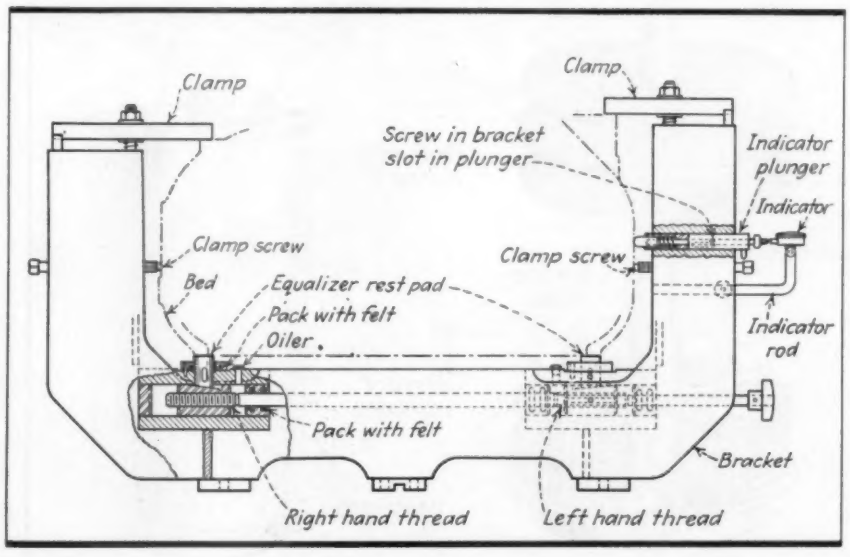
The use of a small amount of lubricant, where the tolerance permits, is desirable. Experiments have been conducted, using glass against glass, and the wear without lubricant and without carefully cleaned cavities was rapid. A light lubricant reduced the wear appreciably. The use of such a lubricant is not always permissable, but in cases where it is, the life of the glass gage will be increased.

Dial Indicator Makes Possible Quick, Accurate Clamping

BORING THE SPINDLE HOLE in one-piece turret lathe beds presents an unusual problem of alignment, since the work must be clamped into position upside down yet strains caused by the distribution of the irregular weight of the lathe bed must be avoided and distortion due to excessive clamping pressure must be avoided. To cope with these interrelated factors, Warner & Swasey uses a large boring fixture and clamping frame of its own development, and the base-plate of this is bolted onto the boring mill table with the aid of an outboard support.



Large turret lathe beds are rigidly clamped and spindle holes bored true with the ways by means of this fixture. The jig plate is mounted in front of the adjustable head clamp and a pilot jig is located on the first of the three uprights on which the ways rest



Quick clamping with no distortion is made possible by the dial indicator and adjustable rest pads incorporated in the head clamp. When work is being inserted, the indicator can be swung out of the way and the plunger withdrawn by rotating it slightly until the screw which fastens it in the frame clears a slot in the plunger body

The fixture consists of three upright braces, one which contains the outside boring bar pilot, plus a special upright bearing the inside boring bar pilot at the end of the fixture, and between the two boring bar pilots is located a special clamping frame. The lathe bed is inverted and its finished way rests on the three upright braces, with the lathe head hanging in front of the cutting head of the boring mill and resting within the clamping frame. In this position the surface to be machined is more convenient to the operator.

Single Screw Controls Alignment

Partly supported by the braces, the weight of the lathe head is further supported within the clamping frame by two adjustable rest pads bearing on tapered blocks joined by a single equalizing screw. The screw makes possible the simultaneous adjustment of both pads by turning one hand knob until the weight of the entire lathe bed rests in the desired vertical position on the two pads and the three upright braces. Such position is naturally determined by the desired alignment of the bed to the boring bar bearing pilots.

When this has been done, the head must be clamped to prevent lateral movement. To avoid distortion which might result from excessive pressures from the clamp screws at the side of the special frame, a dial indicator set-up is used to gage the clamping strain. The indicator is brought to bear on the end of a spring-loaded plunger which rests on the left side of the lathe head so that any strain developed in the workpiece can be read directly from the gage. Then the clamp screw on the opposing side is tightened until a 0.003 in. deflection is recorded. After this, the near screw is tightened until the gage again reads zero. Thus, the work is truly aligned with sufficient pressure to give rigid clamping and no distortion.

Once located horizontally and vertically, the work piece is further held in place by bringing to bear on it clamps at the top of the frame and tightening them. Then the work of boring the spindle hole can proceed.

Fixtures Boost Pit Furnace Capacity

BY JOSEPH SAMMON, CHIEF FOUNDRY ENGINEER, THE DRIVER-HARRIS COMPANY

Maximum efficiency is realized from pit-type furnaces when the work supporting means is designed with an eye upon the nature of the parts, the heat-treating process and the quality standards involved

TO A CONSIDERABLE EXTENT, armament manufacturers have met their needs for expanded heat-treating facilities by the installation of pit furnaces. Some of these furnaces are of huge size, but the majority can be classed as those in which a cylindrical work chamber (above or below floor level) is capable of holding several hundred pounds of partially fabricated parts. Many hundreds of these small self-contained pit furnaces have been installed in the past several years.

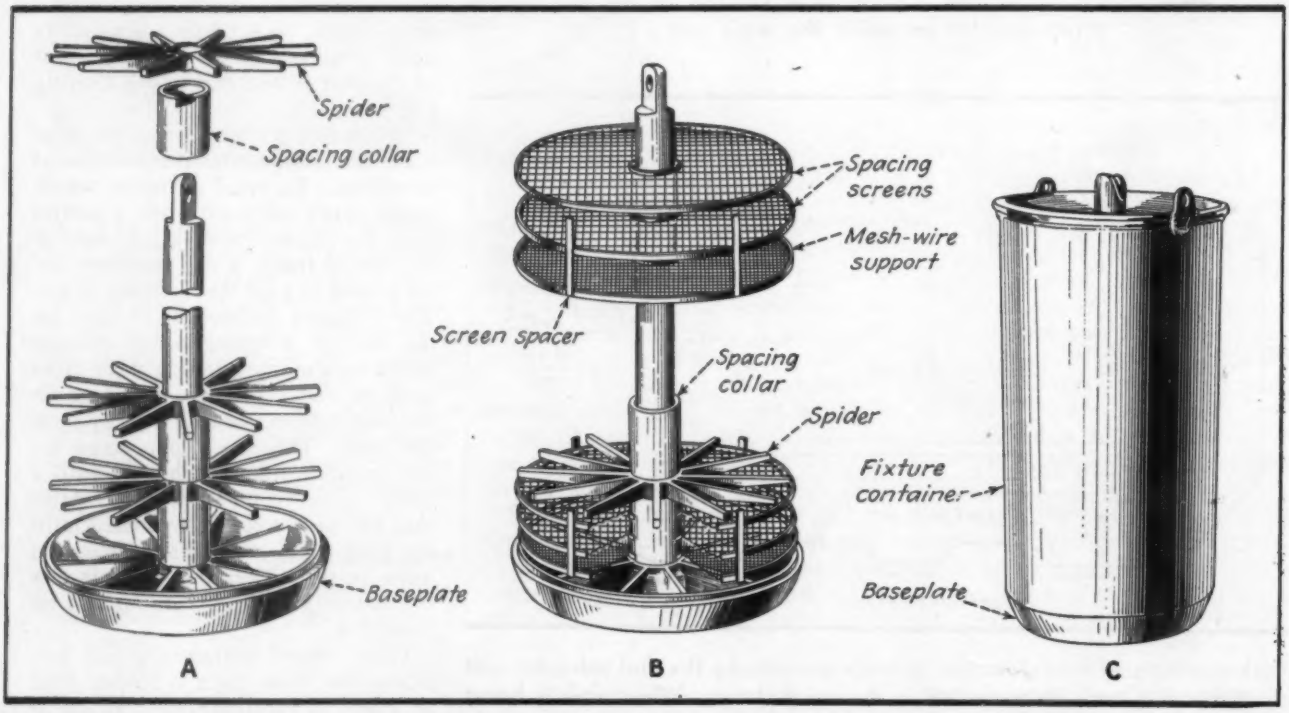
In step with this trend, there has been considerable development in heat-treating fixtures for pit furnaces. By the time aircraft-engine and similar high-quality parts reach the carburizing, nitriding or hardening stage, they represent a considerable investment—often several hundred dollars per piece. There has been a considerable demand for suitable heat-treating fixtures for the following reasons:

1. To avoid or minimize distortion, and thereby reduce scrap or the need for additional machining operations.
2. To insure uniform process results upon all pieces in the charge.
3. To increase the actual load of workpieces per charge as compared to haphazard loading. The increase may amount from 25 to 50 percent, and in some cases it is much higher.
4. To avoid soft spots, or at least confine them to non-critical areas, during carburizing or nitriding cycles.
5. To conserve labor and minimize furnace downtime by an organized system of loading and unloading the charge.
6. To place batch heat-treatment upon a production basis (through a combination of the above factors) so that machining departments can rely upon pit furnaces to supply uniform and properly heat-treated parts at definite overall time cycles.

Furnace fixtures are subjected to exceptionally severe service, and their design is usually the province of the specialist in heat-resistant alloys. Nevertheless, certain principles of design and application have emerged during the war period. This knowledge will help the pit-furnace user to understand the problems that arise in his shop and to visualize the probable solution.

In general, fixtures for pit furnaces fall into two broad classes: (1) the spider type for carburizing or nitriding cycles followed by a long slow cooling period, and (2) the rod type for parts that are quenched. Elements for both types can be made up in endless variety.

The spider-type fixture is designed specifically for either a carburizing or a nitriding cycle, because the difference in process temperatures has a



Spider fixtures of several types can be designed to fit into one size of work container C, permitting the shop to handle a variety of work in one size of pit furnace. Spiders can be used to support work directly as in the assembly shown at A, or in combination with mesh-wire screens, at B, if the product is small

strong bearing upon the proportions of the fixture elements. Furthermore, a carburizing fixture must be made sufficiently heavy to withstand the deteriorating influences of carburizing gases. To facilitate repairs, fixture components are made as simple and small as possible, so that they can be replaced easily in case of damage. Otherwise, the entire fixture or a large portion of it might have to be scrapped because welding is not usually a satisfactory repair method for heat-resistant alloys that have been subjected to repeated heating and cooling cycles.

Spider fixtures are used in two ways: (1) to support workpieces directly, or (2) to support wire screens which receive the parts. The latter case requires the use of all basic elements for a spider fixture, namely:

1. The cast baseplate, ribbed for stiffness, is made with openings to permit circulation of carburizing gas.
2. A post welded to the base and provided with a lifting eye at the top.
3. Spacing collars that can be slipped over the post.
4. Cast spiders or work arms that can be slipped over the post and spaced vertically by the collars.
5. Wire-mesh screens that can be placed over the post and be supported by the spiders.
6. A shell container placed over the fixture and sealed at the bottom by a circular groove in the baseplate. When placed in the pit furnace, the shell and fixture assembly is not covered, and the shell acts as a flue to accelerate the flow of carburizing gases through the charge.
7. A cover is placed over the shell after the carburizing cycle is completed. By means of the lifting eye protruding through the cover, the entire load of shell, fixture and work is removed from the furnace and set aside to cool slowly. This method of handling permits the carburizing furnace to be recharged immediately by another loaded fixture and a new cycle commenced.

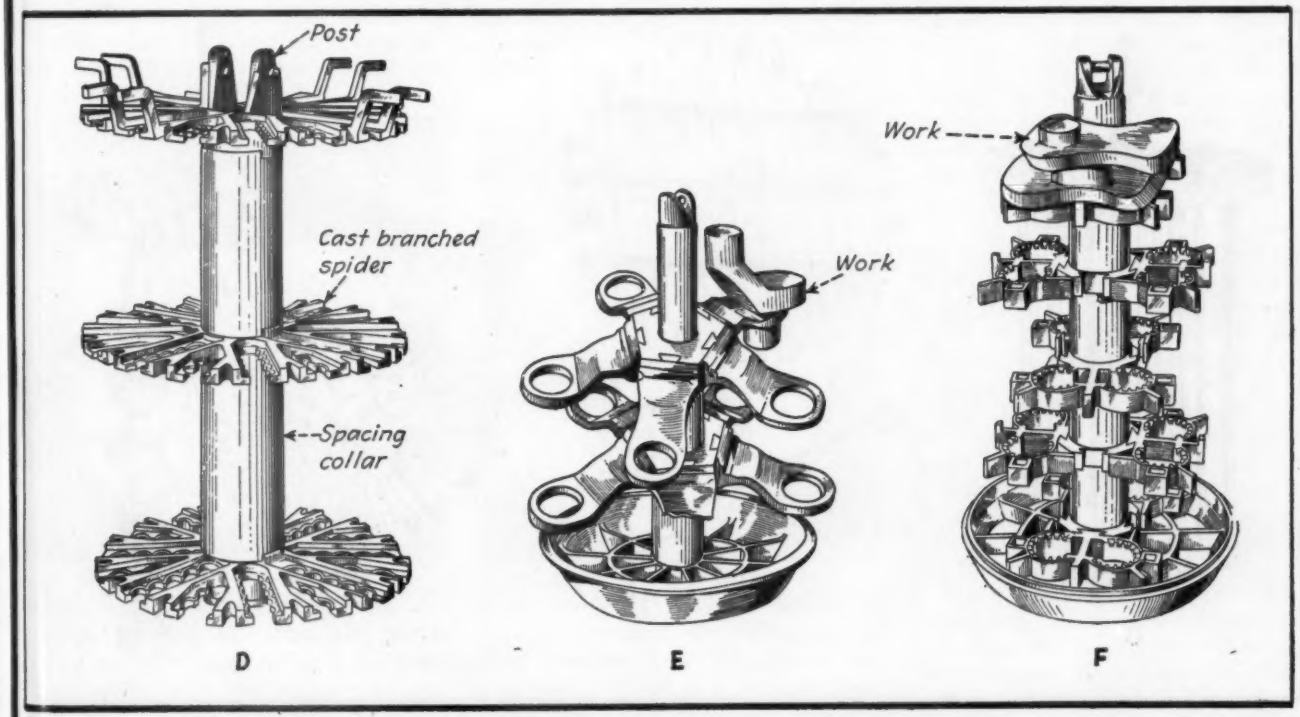
Screens Take Small Parts

The wire screen may be made up in a variety of ways, but the idea is to choose a design that minimizes contact of the wearing surfaces on the parts with the wire. Small parts may be scattered over a disk-like screen that has a reinforcing strip at the periphery and another at the central hole. This type of screen may be tiered by the use of ring spacers. Sometimes a variety of workpieces are loaded upon tiers of different heights.

If the work must be placed vertically to avoid distortion and confine soft spots to the ends, a disk-like screen is used for support and a wire spacing frame is placed on top of the screen to position the pieces and hold them upright with a minimum of contact. The spacing frame may consist of two screens snapping into lugs on uprights welded to the lowest screen, or the spacing frame may embody its own supports.

The plain spiders customarily used with screens can be employed alone for pieces that can be strung on wires or rods. The latter are merely fastened on, or hooked over, the spider arms.

Production parts too heavy for loading upon screens may be placed upon spiders specially designed to receive them. Such spiders are made to support the work in the horizontal or vertical position. Gears, rings and bushings are examples of items that may be heat-treated by placing them on top of the spider arms, usually so as to bridge the distance between adjacent arms. For proper spacing, support and reduction of contact area, the upper surfaces of the spider arms may be provided with integral bosses, serrations, knife edges or even V-blocks. Shafts and other items that must be held vertically are suspended from slotted spider arms, provided the piece has a suitable projection. The slots are usually arranged in a radial pattern to obtain maximum loading. In fact, each spider arm may be branched to provide one long slot and shorter slots on either side to avoid wasting charging space. Metal surfaces adjacent to the slot may be smooth, recessed to form a work nest,



Spiders of special design are often required for heavy or odd-shaped pieces to provide proper support and more effective loading of the furnace. The branched spiders at *D* utilize container space to best advantage. Those at *E* and *F* were designed to handle aircraft crankshafts with minimum distortion

or provided with teeth or knife edges to give point contact support, as dictated by the requirements of the part.

For pieces of still larger mass, the spiders may consist of individual arms dovetailed to a central collar. This construction minimizes casting and machining difficulties with complex arms, and permits ready replacement of an arm in case of failure. Handling of the arms without a hoist is also a feature of this construction.

Individual dovetailed spider arms arranged in a pre-planned pattern may increase the work load by as much as 50 percent when carburizing heavy parts such as an aircraft engine crankshaft weighing 80 lb. The arm is designed to support the crankshaft so that warpage is overcome. In one example, a spider consists of five arms, each having one hole to receive one workpiece. There are three complete spiders in the assembly, and hence fifteen crankshafts are heat-treated per charge—in other words 1200 lb. of work at once.

Fixtures Seldom Machined

Machined surfaces are rarely required in heat-treating fixtures. In special cases, however, such as some aircraft-engine gears with exceptionally close tolerances for face run-out, a machined locator pad may be placed on the spider arm before the work is positioned. One gear is so exacting in this respect that the locator must be remachined after each heating cycle. But in 99 percent of cases, the fixture can be designed (and cast to close tolerances) so that cast spider construction will hold warpage within desired limits, prevent misloading and provide for equal heating of all surfaces of the piece.

Fixtures used for heating to hardening temperature in a pit furnace and then to carry the work into the quench are subjected to more drastic thermal shock than those used for carburizing and nitriding cycles. Hence quenching fixtures are of the hanging type, in that they consist of a number of work-supporting rods suspended from casting with a lifting eye.

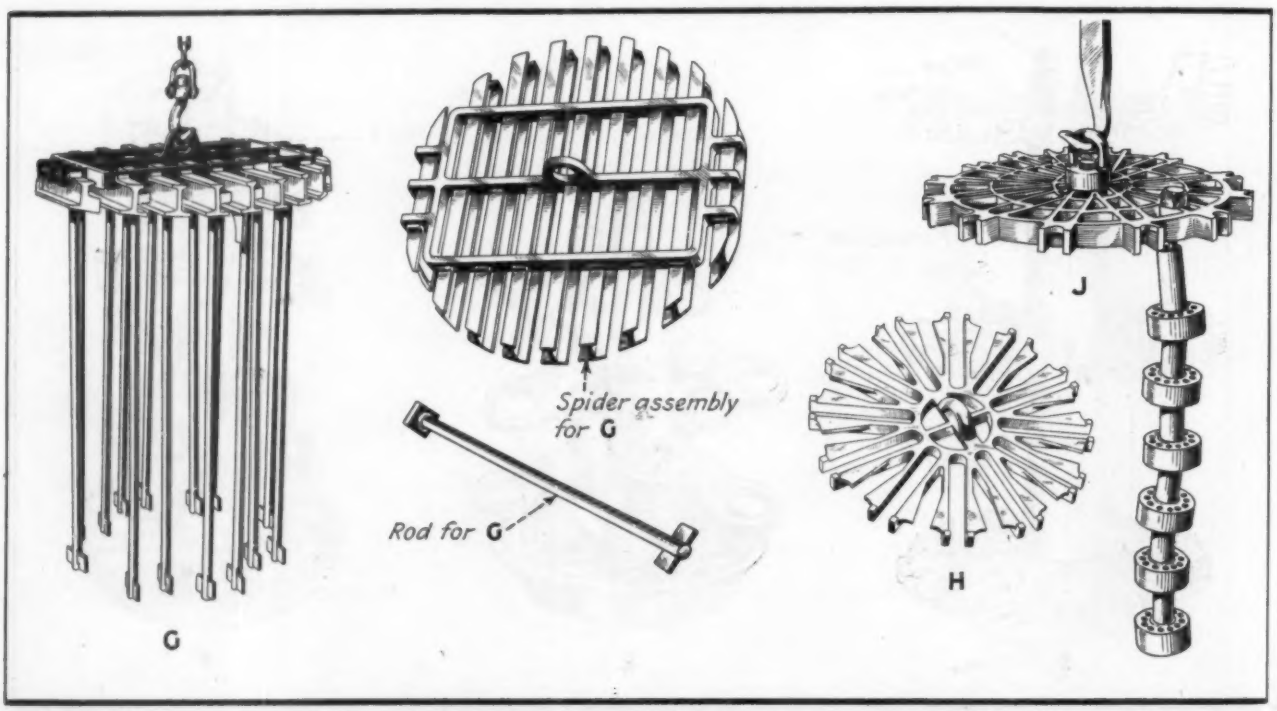
Rod-Type Fixtures

The casting may be made in at least four forms: (1) a spider with open-ended radial slots, (2) a plate-like casting with a number of closed slots, (3) a casting with integral T-slots on the under surface in an efficient work spacing pattern, and (4) a composite structure in which T-slots are produced by assembling I-beams into a grid casting. T-headed work rods are used with the T-slotted construction above; for castings with closed slots the work bars have the upper end threaded and a nut acts as the fastener. Both types of rods are fitted with removable keys at the lower ends. These keys keep the work from falling off loaded bars, are pulled out to permit work removal.

If the work is long and slender and must be quenched in the vertical position to avoid distortion, but has no hole, it may be held by a forked casting that has a T-head to engage a T-slot in the fixture casting. The forked casting obviously must have some place to grip, say under a projection on one end of the work, as in the case of a pinion at the end of a shaft.

Charge Is Increased

These examples of work fixtures for pit furnaces serve to indicate how the heat-treating problems of metal-working plants have been translated into devices that minimize distortion, permit larger loads to a charge, and can be loaded and unloaded properly by unskilled labor. By adapting foundry techniques and a knowledge of the behavior of heat-resistant alloys at elevated temperatures to these requirements, it has been possible to supply fixtures for furnaces with a capacity up to 2000 lb. to a charge. Fixture weight may run from 10 to 40 percent of the total charge, but the actual load increase made possible by fixtures may run from 25 to 50 percent and even up to 100 percent. Of greater importance is the fact that uniform heat-treatment and avoidance of warpage has reduced finish machine operations and curtailed scrap.



Rod-type fixtures are essential for work that must be quenched. The spiders supporting the rods on which parts are strung take a variety of forms. *G*—an interlocked grid of I-beams; *H*—branched for maximum use of container space when loads are not too heavy; *J*—slotted and ribbed for heavy loads

Calculations for Screw Machine Cams

BY A. AINSWORTH, GENERAL FOREMAN, SCREW MACHINE DIVISION, THE McKINNON INDUSTRIES LTD.

Here are five tried methods for figuring thread lobe rise on Brown & Sharpe automatics, together with explanation as to when and why they are used

PERHAPS no phase of screw machine cam and tool design is subject to as many personal theories, formulas and arguments as the correct construction of thread lobes on cams for the Brown & Sharpe automatic screw machine. Those not entirely familiar with this machine's requirements are likely to dismiss the topic by comparing its needs with those of a multiple-spindle automatic.

In considering the best method of obtaining a thread we usually fall back on a lathe or similar tool where a single-point cutting tool is advanced an amount equal to the lead or pitch of the part in one complete revolution of the work or spindle. The same accurate results are possible now on automatic screw machines with threading dies or chasers, when they are properly applied, with the added advantage that the thread is completed in one cut.

Modern screw machine threading falls naturally into two separate and distinct methods each of which require equally different and distinctive thread lobes to produce good threads. The two methods widely used are: (1) Use of self-opening die heads where the die head, when correct length of thread is cut, opens up and the thread is complete, and (2) use of solid dies which require the reversal of work spindle to backoff the work.

Both types of threading equipment fill important positions in the screw machine field and each has distinct advantages when properly applied. The first is particularly suited to use on long threaded parts and the second on such small work as typewriter or optical parts.

Five Examples on Same Job

I have chosen five comparative methods to show variance in final required die lobe rises for a screw threaded a distance of 0.875 in. at 40 threads per in. with a self-opening die head. Each method results in the same ultimate thread.

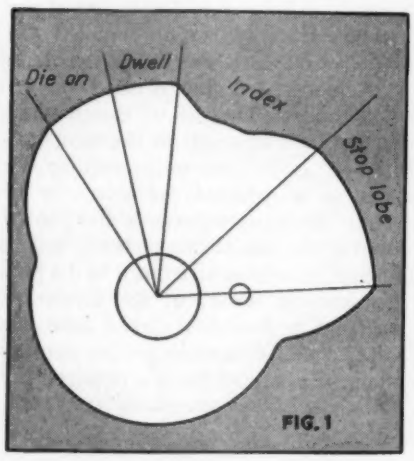


Fig. 1—Cam for self-opening die head showing the lobe and dwell. The part for which this was designed is identical with that to be produced by the cam shown in Fig. 2. Index cycle time is 3 sec. and spindle speed from 600 to 1,200 r.p.m.

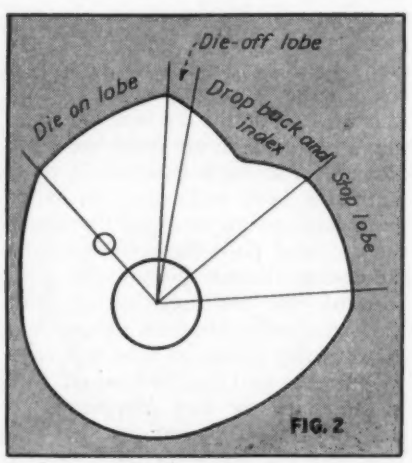


Fig. 2—Cam for solid die head to be used in producing the same part as that resulting from the use of the cam in Fig. 1 with a self-opening die head. The same cycle and same spindle speeds are used in either of the two instances

These are the five methods of determining the required rise:

1. A die lobe representing the exact duplication of a lead screw in an engine lathe; a 40 pitch thread advances 0.025 in. per revolution of spindle or part. $\left(\frac{1.000}{40} = 0.025\right)$ Thread length of $\frac{7}{8}$ in. equals 35 revolutions. $\left(\frac{40 \times 7}{8} = 35 \text{ rev.}\right)$ To this add three revolutions for approach to the work, making a total of 38 revolutions to thread the part. Multiply the 38 revolutions by the 0.025 in. rise per revolution to determine that 0.950 in. die lobe rise is required.

2. The general recommendation of self-opening die head manufacturers is the actual lead as shown by method 1, plus 5 percent. Required die lobe rise is then 0.950 in. times 1.05, or 0.997 in. die lobe rise.

3. Another principle holds that the die head must advance 12.5 percent ahead of lead on the cam as compiled by actual required lead on the part to be threaded. After this is determined, divide results of 12.5 percent less than actual lead into the length of thread required. This result equals actual revolutions required to complete the thread. To this add four revolutions for approach and the total number of revolutions is determined. To find the required die lobe rise multiply the actual $\frac{1}{8}$ lead by the total revolutions and then subtract 10 percent. Converting this into figures we find that a lead of 0.025 minus 12.5 percent equals 0.022 in. lead. A threaded portion of 0.875 in. divided by 0.022 in. lead equals 39 revolutions. This plus 4 revolutions for approach equals 43 required revolutions of spindle to complete the thread; multiply 43 rev. by 0.022 lead equals 0.946 in. rise; this less 10 percent equals 0.852 in.—the required die lobe rise.

4. By a fourth method the following information must be known:

(a) Actual number of revolutions required to thread; (b) ten percent of this figure to add for approach; (c) ratio between threading and cutting spindle speeds; (d) complete machine cycle time to produce one part; (e) spindle speeds at which job is to be run; (f) die lobe revolutions convert-

ed into hundredths of cam space, and, (g) revolutions of spindle per hundredths of cam space at threading spindle r.p.m.

Using this information, 7/8 in. of 40 t.p.i. thread requires 35 rev.; adding 10 percent, this equals 39 rev.; multiplied by ratio of difference between spindle speeds (1474 r.p.m. divided by 663) or 39×2.22 equals 86 revolutions. With a known machine index time of 18 1/3 sec. we can determine the total revolutions at 1474 r.p.m. to complete the job and determine the hundredths of cam space required to thread. Converted, this is 18 1/3 sec. at 1474 rev. or 450 rev. (4.5 revolutions per 0.01 of cam space). Thus 86 revolutions are required to complete the thread, therefore 86 total revolutions divided by 4.5 equals 0.19 of cam space required to thread. Converted into revolutions at threading spindle speed the 450 revolutions required equals 205 or 2.05 revolutions per cam space.

The formula then used is: Pitch in thousandths × revolutions per cam space at threading spindle speed × cam space to thread in hundredths = the required die lobe rise.

Numerically this is: $\frac{6.000}{40} \times 2.05 \times 19 = 0.973$ in. required die lobe rise.

5. Another widely used formula is:

Die lobe rise = $\frac{\text{Revolutions required to thread}}{\text{Number of threads per inch}} \times \begin{cases} \text{a variable constant for} \\ \text{groups of threads} \\ \text{known as A and B.} \end{cases}$

(A) = 0.85 for 14 to 24 t.p.i.
(B) = 0.88 for 28 to 48 t.p.i.

Translated to our example this is $\frac{38}{40} \times 0.88 = 0.836$ in. required die lobe rise.

Methods 1, 2 and 4 Recommended

In checking the figures shown in Table I it will be noted that method 3 shows a higher cam lobe to thread than method 5. However, the former method allows more revolutions to thread and when proportioned out to equal advance per revolution it is found to be less than No. 5. This means that the thread in method 3 will cover more cam space, but will have less lead on the lobe as compared with No. 5.

A self-opening die head has a bumper spring which allows lead on the cam to either equal or exceed the advance of die head per work spindle revolution. Another die head feature compensates for worn index parts to eliminate variances in thread length. This is the outside trip. When a cam is designed to equal or exceed required lead, the outside trip will assure equal threaded lengths regardless of machine wear.

Method	Req. Rev. to Thread	Req. Die Rise Lobe	Die Head Adv. per Spindle Rev.	Lgth. of Thd. Portion	Threads per in.
x1	38	0.950	0.025	0.875	40
x2	38	0.997	0.026	0.875	40
3	43	0.852	0.019	0.875	40
x4	39	0.973	0.025	0.875	40
5	38	0.836	0.022	0.875	40

x Recommended

Table 1—Results of thread lobe rise calculations by the five methods described. These were figured for self-opening die heads

Method	Req. Rev. to Thread	Req. Die Rise Lobe	Die Head Adv. per Spindle Rev.	Lgth. of Thd. Portion	Threads per in.
1	38	0.950	0.025	0.875	40
2	38	0.997	0.026	0.875	40
x3	43	0.852	0.019	0.875	40
4	39	0.876	0.0225	0.875	40
x5	38	0.753	0.0198	0.875	40

x Recommended

Table 2—Variation in thread lobe rise calculations by the five methods when applied to cams for use on solid die heads

Considering the requirements and my personal experience I recommend that methods 1, 2 or 4 be used to determine self-opening die thread lobes.

With solid dies, where the die must be threaded on and off the work, different factors must be taken into consideration. The die head must lead on the thread-on and thread-off portion of the lobe, as faulty threads may be produced during either operation. Generally speaking there is no bumper or compensating spring in solid die heads, thus the lead on the die lobe must permit a slight lead off from the start. However, too much lead would result in the die head pulling out to its extreme and causing stripped threads, as the die head pulls the turret forward, rather than the cam pushing the turret forward. On the thread-off operation the same difficulties are encountered. An incorrect thread-off lobe will cause the turret to pull the die head off. This is caused by the cam dropping away too quickly. Crowding of die head back into the holder before it is clear of work is caused by a cam designed with drop away too slow. Either condition results in poor threads.

Considering these possibilities, it is safe to say that a cam lobe for a solid die head requires more care and consideration than is required for the construction of one for a self-opening die.

In reviewing the requirements of the two types of die heads we find that the first two methods of determining the thread lobe rise cannot be applied to calculations for the solid die heads.

Method 3 is entirely satisfactory for solid die head lobe construction, but care must be taken to use the extra revolutions, which require more cam space and thereby decrease the actual lead on the cam.

In applying method 4 take this same formula and use only 90 percent of the die lobe rise computation obtained. On the example used this would result in a die lobe rise of 0.876 in.

Method 5. The use of this method will, of course, result in the same calculation as for the self-operating die lobe, or a required die lobe rise of 0.836. Personal experience has shown me that the use of this method, with a further reduction of from 8 to 10 percent on the results of its calculation produces a desirable thread lobe for solid die head threading. On our example this would mean a required die lobe rise of approximately 0.753 in.

Helpful Practices Suggested

There are several suggestions on good threading practice which should be helpful, regardless of the type of threading equipment used. These are:

1. With the exception of No. 00 Brown & Sharpe machines with 2,400 r.p.m. maximum spindle speed, all 3-speed counter shaft models and all

Model G automatics, backshafts are driven from a counter shaft. This often results in incorrect relation between spindle and back shaft revolutions. Belt slippage also contributes to this condition, as a slipping spindle belt and a good driving back shaft will crowd the die head onto the work. The reverse condition will cause the die head to lag and an incorrect start and follow up will result.

2. Spindle clutches not correctly adjusted may cause slippage or one spindle driving against the other with poor threading as the result.

3. A job so cammed that the die head must pull the turret along, instead of leading out in front, will cause defective threading.

4. Cams with excessive lead will result in distorted or stripped threads. A correct thread lobe will present die head to work with a positive start then recede slightly and follow up die head to completion of thread length.

5. Self opening die lobes require a dwell at finish of the lobe to allow die head to open correctly.

6. With the exception of one make, solid die heads have no allowance for the addition of a bumper spring. Therefore, the die lobe must allow the die head to lead ahead from the start of the rise.

7. Self opening die lobes are cammed heavier than those required for solid die threading.

8. Misalignment between spindle and turret will usually result in tapered threads.

9. Worn die head parts or bent shanks will also result in a bad thread.

10. Outside trips should be used if incorporated in die head.

11. A solid die head incorporating both bumper spring and adjustments for misalignment of spindle is highly recommended.

12. Grinds on chasers will greatly affect threads produced.

13. A die lobe designed for use with solid die head usually will not allow the substitution of a self-opening die head. The cam will contain no dwell at top of lobe and clearances to approaching cross slides are usually insufficient, due to larger diameter of self-opening die head.

14. A solid die can never be used in conjunction with a die lobe designed for a self-opening head, as no provision is made for a thread-off portion on cam lobe.

15. Threads of coarser pitch require greater allowance when deducting from actual rise for computing rise on a thread lobe as they require more power and are apt to cause belt or clutch slippage.

Take a Healthy Chip—Discussion

BY JOHN B. KITTERING

IN THE ARTICLE by F. J. Wintersdorff the method of calculating the maximum chip thickness in two steps winds up with the same results as the approximate formula customarily used and based on the assumption that the path of the cutter is very nearly a circular arc. This formula is:

$$t = 2f_t\sqrt{\frac{d}{D}\left(1-\frac{d}{D}\right)}$$

Where:

t = max. chip thickness
f_t = feed per tooth
d = depth of cut
D = diameter of cutter

As will be seen from Fig. 1 (which is a copy of the article's Fig. 1) Mr. Wintersdorff erroneously takes the dimensions parallel to the direction of the table travel as the maximum chip thickness, viz the dimensions 0.008, 0.00789, etc.

An undeformed milling chip, however, does not have varying dimensions parallel to the feed motion; this dimension is constant and equal to the feed per tooth. A chip as shown in Mr. Wintersdorff's Fig. 1 is not produced in milling. The correct maximum thickness for any given depth of cut is indicated by t on Fig. 2.

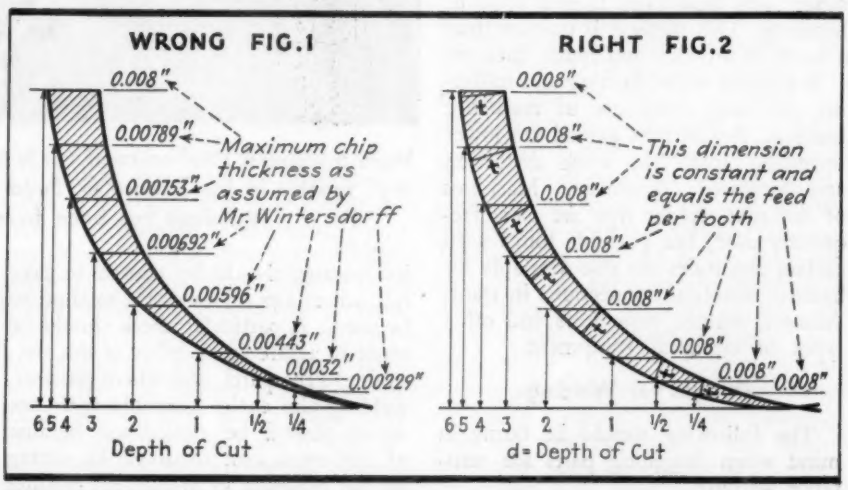
The following quotation from the article illustrates the author's mistake as to the correct shape of a milling chip:

"Let us assume that the table feed is set so that the work *seems* to advance at a rate of 0.008 in. per tooth. The word "seems" is used advisedly. Although this figure does represent the table feed, the work never progresses at the same rate, unless the depth of cut is equal to the radius of the cutter."

The word "seems," which is emphasized by the author, is out of place, because the work actually does progress at that rate. Even in the case—not considered by Mr. Wintersdorff—when the machine is appreciably overloaded and perhaps vibrating, it is true that the dimension of the undeformed chip in the direction parallel to the table travel equals the instantaneous feed per tooth.

Maximum production depends on many cutting variables in addition to the ease of operation of the machine. The metal removal in cubic inches per minute is the proper criterion for optimum conditions so far as the cutting process itself is concerned. It does not merely depend on the maximum chip thickness but on the efficiency and capacity of the machine, the shape, material and set-up of the work, the depth of cut, width of cut, diameter of the cutter, number of teeth, tool angles, cutting speed, type of cutting fluid, admissible cutting force.

Planning of a mass-production milling job can therefore not be based on maximum chip thickness alone but must take all the other variables into consideration. In the case of single jobs a proper assumption of the feed per tooth will give a sufficient approximation.



For any given depth of cut, the correct value t for maximum thickness of chip is given in Fig. 2

How to Use Resistance Welding

BY R. T. GILLETTE, WORKS LABORATORY, AND J. F. YOUNG,
ENGINEERING GENERAL DIVISION, GENERAL ELECTRIC COMPANY

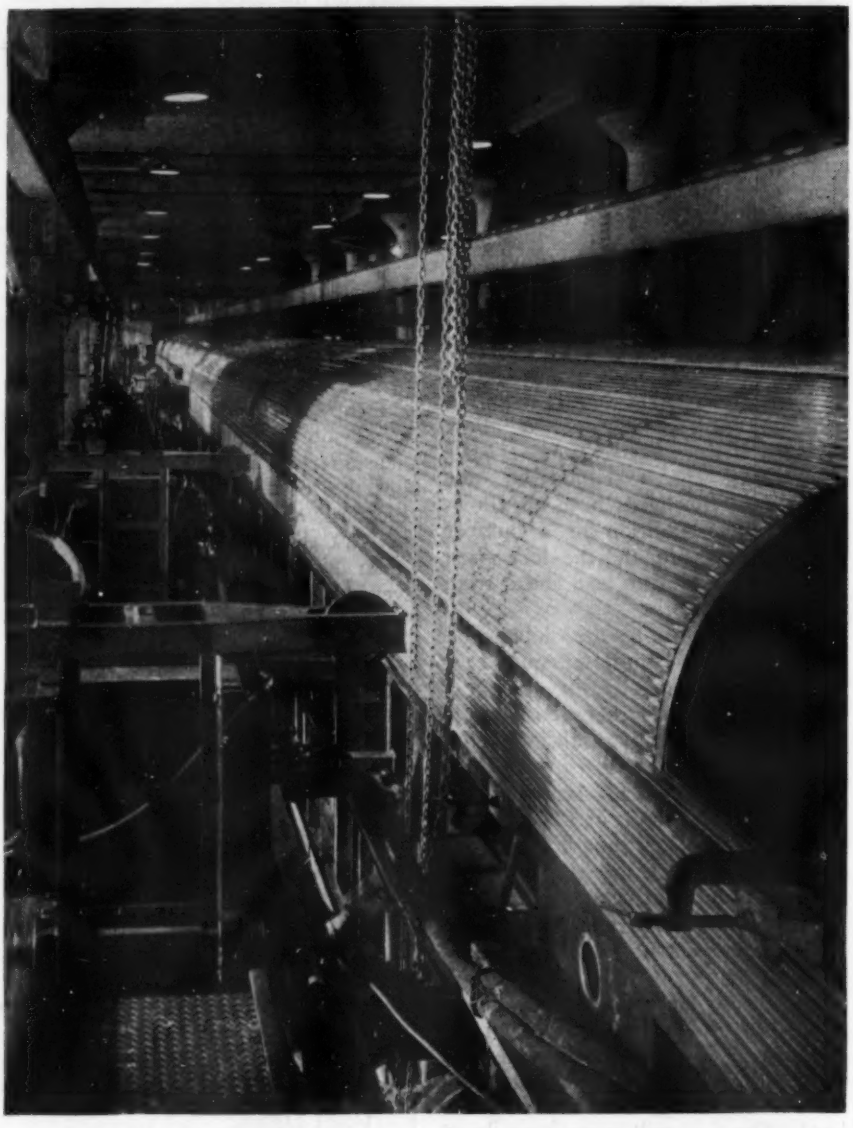
VII—Equipment designed for resistance welding may come in handy for other uses. But to get the optimum results from welding applications, particular attention must be given to the design and preparation of parts

RESISTANCE WELDING EQUIPMENT has many miscellaneous uses that cannot be classified as welding.

By using a tungsten punch and a copper die as spot welding electrodes, holes can be burned in hardened steel parts such as saws, thin milling cutters and flat spring stock. The holes are clean, they do not start cracks in the adjacent material, and the annealing action does not extend any appreciable distance from the hole. The method is fast—a hole can be burned in 1/32-in. stock in a quarter of a second. Although these holes are not as accurate as a drilled hole, they are satisfactory for many purposes.

Both spot welders and butt welders have been used for annealing. With the latter, such parts as tubing, wire, structural shapes and hardened shafts that are to be straightened have been annealed, and pipe, angles and many other parts have been heated prior to bending. This method is quicker than a torch or furnace and much cheaper.

A number of the brazing and soldering processes make use of resistance heating. Advantages gained are lower operating cost, less work distortion and increased cleanliness. Machines of the spot welder type are most frequently used, but portable tongs with carbon electrodes are also available for brazing electrical connections in transformers, motors, generators and other types of electrical equipment.



Here a stainless steel railroad car is being built by the so-called "shot-welding" process at the Edward G. Budd Manufacturing Company. This prewar technique has been found useful on war products

Designs for Welding

The following should be borne in mind when designing parts for resistance welding.

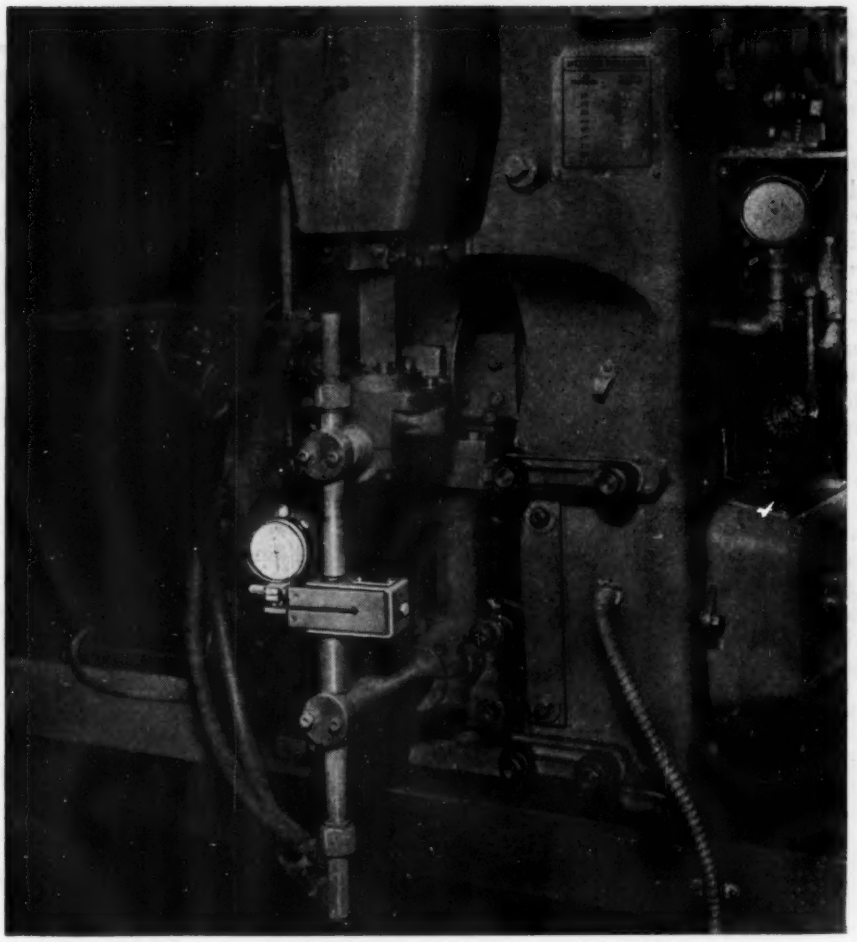
Simplicity should be given first consideration. As the product is designed, its features should be chosen to take full advantage of the weld method to be used. A particular check should be made to assure accessibility of the electrodes to the parts, and where possible, welding the entire assembly with one set-up should be considered because of the extra cost involved in setting up the machine in a different manner several times during the welding of one assembly.

The practice of making hand-made full-scale samples, or small-scale models, to determine the accessibility of the various parts of the equipment available will many times furnish suggestions of minor changes in the design which make the welding easier and will greatly reduce the cost of welding. Full scale samples may also be used to determine the type and capacity of welding equipment to use for the job.

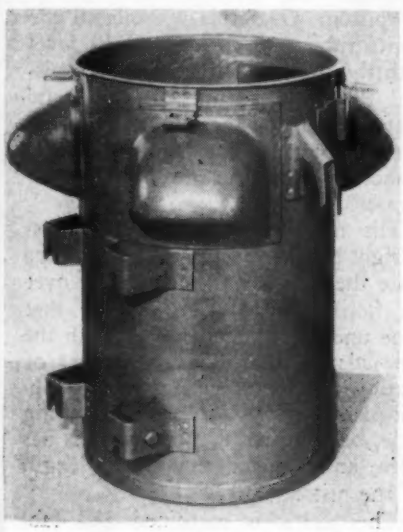
When considering a change from another method of fabrication to resistance welding, the designer should study the product from the welding viewpoint. Frequently it is possible to reduce the material used by taking advantage of the strength of a joint when it is welded instead of being weakened by holes for riveting, bolting, etc. Other savings may be gained (*a*) by changing from a lock seam to a butt or seam weld, (*b*) where welding avoids the waste of material in some types of bayonets or tongues and slot joints, and the cost of complicated dies for making these, and (*c*) from the possibility of welding several thicknesses of material together at one time or from joining a thick and a thin piece at some section.

The quality and accuracy of a resistance welded assembly are determined by the equipment used and by the way in which the jigs, tools, fixtures and machines are set up and maintained. Preparation of parts for welding by any method should be done carefully so that the components of an assembly will fit together without requiring the operator to spend time straightening or hand-fitting them. It is emphasized that the accuracy of a welded assembly can be no better than its component parts. The various types of welders cannot be expected to act as hydraulic presses to correct improperly formed fits. The copper alloy dies, electrodes and fixtures will not hold up under the forming work, and the pressure at the weld junction will differ from part to part.

The various materials that can be welded have already been discussed at some length. Note that welding high-carbon steel will result in brittleness in the heat-affected zone. Such welds are likely to fail in vibration or shock and are not reliable unless the weld area or the entire part can be heat-treated. Sometimes this may be done by a post cycle of reduced current on the welding machine. The precipitation-hardened aluminum alloys are also affected by the welding heat and may require some heat-treatment after welding to restore properties.



Electrode pressure may be measured by a gage to adjust it properly for a given job; but the parts must be correctly made as it is poor practice to use welding equipment as a straightening press



Various types of resistance welding can often be advantageously used in combination. This all resistance-welded transformer tank forms a good example

Cleaning metal in preparation for welding is one of the most important factors in controlling the quality and consistency of the product. Unfortunately, it is the one factor that is most frequently neglected. As has been pointed out, the resistance of the contact surfaces is important when making welds. If various thicknesses of scale, grease, dirt, paint, oxide and rust are on the material, the contact resistance cannot be expected to be uniform on all parts. The differences in heating which result will certainly make welding inconsistent, if any weld is made at all, and they introduce the possibility of gas inclusions or slag inclusions in the fused metal. Scale also causes excessive burning and marking of the metal surface and the electrodes.

Blasting with sharp steel grit is frequently recommended as a method of cleaning material for welding. The use of shot should be discouraged as particles of scale are driven into the surface, and the contact resistance becomes variable. Tumbling in a tumbling barrel will burnish the surface of parts but will not remove scale. Sand-blasting must not be used on any material for resistance welding because enough sand may be driven into the surface of the parts actually to insulate them from each other or at least to cause a great variation in contact resistance.

Successful cleaning has been done by many methods such as pickling, grinding, steel grit blasting and scrubbing (of soft materials) with steel wool. When pickling, a bright pickle is preferable. Rinsing should be thorough to remove any residue left on the

material from the pickling solution, and the cleaning should be done shortly before the material is used to avoid contamination.

There are very few design data available on the strength to be expected from the various types of welds. Perhaps the best method of assuring adequate strength is to make sample welds in the material to be used and test these to destruction. Both the effect of number and location of welds can be checked in this way. Seam welds may be tested by welding completely around two pieces, welding a nipple to one, and expanding the test assembly by pumping water through the nipple. Simple tensile tests usually suffice for butt welds, and both shear and tensile tests may be employed for spot and seam welds. Fatigue tests are important for applications involving cyclic loads since stress raisers of various types may be introduced by the welding.

Several other considerations which are of importance in certain designs for resistance welding are as follows:

1. The position of the electrodes should be such that a minimum amount of magnetic material is introduced into the secondary loop of the welding transformer. Magnetic material in this loop will absorb a great deal of power so the bulk of the workpieces should be kept on the outside. Some power will also be absorbed when the part loops the electrode for any distance because this is favorable to establishing eddy currents of large magnitude.

2. One workpiece may be located with respect to another by a plug, if the plug does not shunt too much current from the weld section.

3. Spot welding can frequently be used to advantage as a means of fastening two workpieces to assure positioning for some subsequent operation such as brazing or seam welding.

4. The possibilities of resistance welding can often be extended by using combinations of the various welding processes, and by welding subassemblies which are later assembled and welded to form the completed article.

In conclusion, it is emphasized that the welds produced by any resistance welding methods will be just as consistent in quality and appearance as the product manufactured by any other method of fabrication if the same care is taken in selecting equipment, supervising and training operators, and selecting and preparing material. The cost of fabricating by welding frequently shows a large saving over riveting, brazing, soldering or other methods used, particularly when the production is large. Many times these savings are as much as 50 to 75 percent. However, low cost welding requires suitable design of parts to employ the advantages offered by the processes.

Plastic Speeds Plating of Landing Gear Piston

BY W. C. McDANIEL, GENERAL FOREMAN, HEAT-TREATING DEPARTMENT, COLUMBUS PLANT, CURTISS-WRIGHT CORPORATION

PISTONS for the landing gear of Helldiver dive bombers are chromium plated in half the time by substitution of Lucite for steel in the thread protecting cap. The crystal clear plastic, a methyl methacrylate resin, has also solved a problem involving uneven plating along the piston.

Prior to the adoption of Lucite, considerable difficulty was encountered in throwing the chromium against the shoulder at the bottom of the piston where 0.006 in. of chrome per wall was required. The original thread protecting cap was made of steel and sprayed with stop-off lacquer to prevent plating. The use of the steel fixture made it necessary to overplate the top of the piston 0.003 in. or more in order to provide a finish grind surface at the shoulder. This resulted in plating the piston three to four hours longer than necessary, had it been possible to deposit chromium equally along the entire length.

An additional problem arising was a much longer grinding operation because of the large amount of chromium at the top f the piston. Investigation showed that the protecting cap would "tree" with chrome, shade off the bottom and draw current from the piston. The discarded method called for an average plating time of 12 hours for each piston.

Practically invisible at the lower end of the landing gear piston, the Lucite adapter and shield protect the threaded portion of the workpiece during chromium plating

Searching for a material which would withstand the powerful cleaning and plating solutions, and at the same time not plate or tree, it was discovered that Lucite plastic would fulfill all requirements. The plastic proved able to withstand all cleaners, acids and the chrome plating solutions without signs of deterioration.

Replacing the steel protecting cap, a Lucite adapter was devised, with a threaded steel insert to screw on to the piston. Over this was placed the Lucite tubing to form a shield level with the top of the flange on the piston. Plating procedure with the Lucite adapter remained the same as with the steel adapter, except that the plastic cannot be placed in a vapor-type degreaser.

The new type adapter at Curtiss-Wright has made it possible to chrome plate the piston walls in slightly over six hours, compared to double that time under the old process. With the new adapter, the required amount of plating next to the flange is now obtained and results in far less grinding time, because the plating thickness has been uniform for the entire length of the piston.

The plastic is machined and fabricated easily at Curtiss-Wright. Lucite tubing, rod and sheet have been utilized in other phases of hard chromium plating, such as adapters for inside threads, protecting plugs and insulators on especially designed racks.

Reconversion *and* Contract Termination

American industry is dedicated to an all-out effort to achieve victory, and its good faith in this direction is amply demonstrated by the results.

American industry also is dedicated to making democracy work effectively after the victory. And it is toward this objective that industry must prepare itself to guide the processes of demobilization and reconversion in order to minimize the dislocations and chaos which too easily can result from so tremendous a task.

We exercised foresight from the very beginning of the war mobilization program. Let us now exercise foresight in the approaching changeover from a wartime to a peacetime economy.

The first step in converting American industry from military to civilian production is the termination of contracts between the government procurement agencies and the producers. There are now in force war contracts amounting to tens upon tens of billions of dollars. As the demand for weapons of war decreases, the Armed Services will undertake to cancel contracts. With the emphasis shifting from weapons of one category to weapons of another category, many billion dollars worth of contracts already have been terminated. It is hoped that the experience now being gained in this work will provide the basis for effective and sound procedures when an avalanche of cancellations comes later.

Many complex problems involved in the termination of contracts will materially influence the success of the entire reconversion program. Once war demands fall off sufficiently to permit the renewal of civilian production, we will have to act with great speed if we are to avoid large-scale unemployment. Prompt financial settlements of contracts and the rapid clearance of plants are of immediate and great significance. In many cases the removal of equipment and raw materials will be more important than money payments. The allocation of raw material for civilian production will be of paramount importance.

Government agencies obviously must exercise great care in spending the people's money and in protecting the interest of the public against excessive payments. Unjust enrichment at the expense of the people will not be condoned nor will it reflect favorably upon management to present inflated claims. But long-delayed negotiations, which will retard the initiation of civilian production, likewise must be avoided.

The contracting agencies and the manufacturers both know that the greatest losses in the reconversion period will result from delays in getting peacetime production under way. The

greatest potential wastes lie in unemployment and in idle plants. The magnitude of such losses to the public can be far greater than the money spent in liberal settlements; to the manufacturer, these losses can represent vastly more than the extra funds that might result from interminable litigation. Policies must be firmly established *now* whereby the manufacturers, including subcontractors and suppliers, will receive substantial settlements immediately in order that ample funds be available for reconverting plants and accumulating necessary inventories of peacetime goods. Nor must we overlook the fact that the uncertainty of long drawn-out disputes will have a stifling effect on enterprise and that final settlements, therefore, should be made as promptly as possible.

Plants that are equipped largely with special wartime tools and machines and that are fully stocked with materials, components, and finished military products will not be able to undertake any substantial degree of conversion until this machinery and this inventory are removed. Advance arrangements are essential for the prompt clearance of great numbers of plants the country over. Adequate warehousing facilities must readily be available so that the changeover to civilian production will not be hampered.

As war demands decline, civilian output will be resumed; and while we recognize that the demands for munitions must vary as the strategy of the military leaders is changed, it is hoped that the Armed Services already have or soon will develop schedules of their continued needs under different strategic assumptions. If we know in advance the probable curtailment in war requirements we are in position to estimate the timing and the quantities of raw materials, the number of workers, and the industrial facilities which will be available for peacetime purposes. It will then be possible to integrate the lifting of restrictions on civilian production with the drop in war production.

Needless unemployment and idle plants will prevail if restrictions on the output of civilian goods are removed at a slower rate than available manpower, materials and plants permit. On the other hand, if the controls on civilian production are removed prematurely or too freely, then the production of military requirements will be hampered correspondingly. There will be great clamor and pressure for eliminating all restrictions as soon as any measurable quantity of materials and numbers of workers are freed from war work. It will react adversely on industry as well as on government if these pressures are heeded indiscriminately, thereby retarding the production of munitions for our boys who still will be fighting and dying at the front. The coordination of declining war demands with increasing civilian production probably is the most difficult and at the same time the most important task in our entire reconversion problem. Advance planning and sound judgment are essential.

An order of priority for initiating non-war or civilian production must be prepared beforehand. The schedule of resumption of peacetime production should be governed by the amounts of

materials, manpower and facilities that are available as well as by the relative needs or importance of different products. There will be strong competition for priority among the various kinds of consumer goods, equipment needed for reconversion, producers goods required for expansion and modernization, and export demands. Relative need obviously is the most compelling criterion. But because of the importance of expediting reconversion, earliest consideration is urged for the tools and fixtures and models which will expedite large-scale civilian production when adequate labor and materials are available. In any case, advance schedules will be needed to avoid a makeshift, piecemeal lifting of controls on the basis of who shouts the loudest.

Another difficult problem of the reconversion period will be to keep to a minimum the distortion of inter-industrial and intra-industrial relationships. Many varieties of consumers goods compete for the consumer dollar, and some industries will offer strong resistance if the green light is given first to industries whose products may thereby acquire a time advantage.

Even more difficult will be the matter of competition between companies producing the same products. Some manufacturers may find themselves tied up with continuing war contracts with restrictions on their peacetime products suddenly lifted and their competitors free to take advantage of the situation. The declining need for different kinds of war materiel will vary greatly, and some producers inevitably will be available for peacetime production considerably in advance of some of their competitors.

This raises the question of victory models or nucleus plants to eliminate competitive advantages among producers of identical products pending the time when all are on an equal footing again. Policies controlling this should take into account the degree or the extent of competitive advantage which reconversion might bring, and also upon the time interval during which these advantages will prevail. Such programs necessarily mean increased government control, hence they should be adopted only under the most pressing circumstances.

There is the important question of termination as between large and small plants. Fairness must be exercised, and undue advantage to either group must be avoided in extending opportunities to continue receiving profitable war orders or in getting back into civilian production. The problems of small manufacturers must not be neglected in this period. Likewise, any restraints on new ventures and on more vigorous competition must meticulously be avoided.

There also is the question of communities which have been greatly enlarged and others which actually have been brought into being by the war. It might be advisable to terminate contracts in these areas first in order that the workers might be encouraged to migrate elsewhere while employment prospects are most favorable. Also, if continued production of some armaments is contemplated after the war, it might be well to concentrate this production in communities which otherwise would be stranded.

If the process of terminating contracts is to be geared into meeting continued demands for munitions and also expediting reconversion, then the Armed Services must accept broad policy considerations as criteria for cancelling contracts. Procurement officers might be inclined to cancel contracts with all high cost producers first. Or they might be inclined to cancel small producers first so as to reduce the administrative burden. Then again, they might cancel the newer producers of specific products rather than the older, time-tried manufacturers.

These procurement criteria may all be highly desirable and efficient but other important considerations such as those mentioned above must be given proper attention. ***Demobilization cannot be a separate process from reconversion.*** They must be united. The termination of contracts is a demobilization task, but I am confident that the procurement agencies appreciate the importance of this operation in facilitating reconversion and that they will take full cognizance of the policies necessary for giving every assistance to initiating peacetime production.

I have not attempted to raise all the important policy questions in terminating contracts, nor do I propose specific solutions for each major problem. Rather it has been my purpose to indicate the complexities of the task which faces us and to urge that intelligent and sound plans be developed now while there is time. By so doing, we can avoid the dislocations and economic disorder which otherwise might characterize the reconversion period. The better we are prepared, the more rapid will be the resumption of full employment and good business after the war is won.

This job of changing America's industrial pattern from war to peace speedily and efficiently, is one which will tax the talents and knowledge of the ablest business men of the country. These men can, and I am sure that they will, attack this task with the same energy and determination that characterized their efforts in the period of mobilization for war.

Industry advisory committees were established to cooperate with governmental agencies in the great task of conversion to a full war economy. These committees are the means through which industry has the opportunity to play a major role in the solution of the problems of reconversion. It must assume that responsibility or accept the consequences in the form of enforced government control. Industry must take a renewed interest in these committees and make certain that our best minds and strongest men are available for the challenging job of conversion which we face now. It is a job that must be done well if we are to have a good start on the road to a greater democratic and free enterprise nation.

President, McGraw-Hill Publishing Company, Inc.

Ground Plastic Spools Retain Critical Dimensions

BY PAUL G. WEILLER, KOLLSMAN INSTRUMENT DIVISION, SQUARE D COMPANY

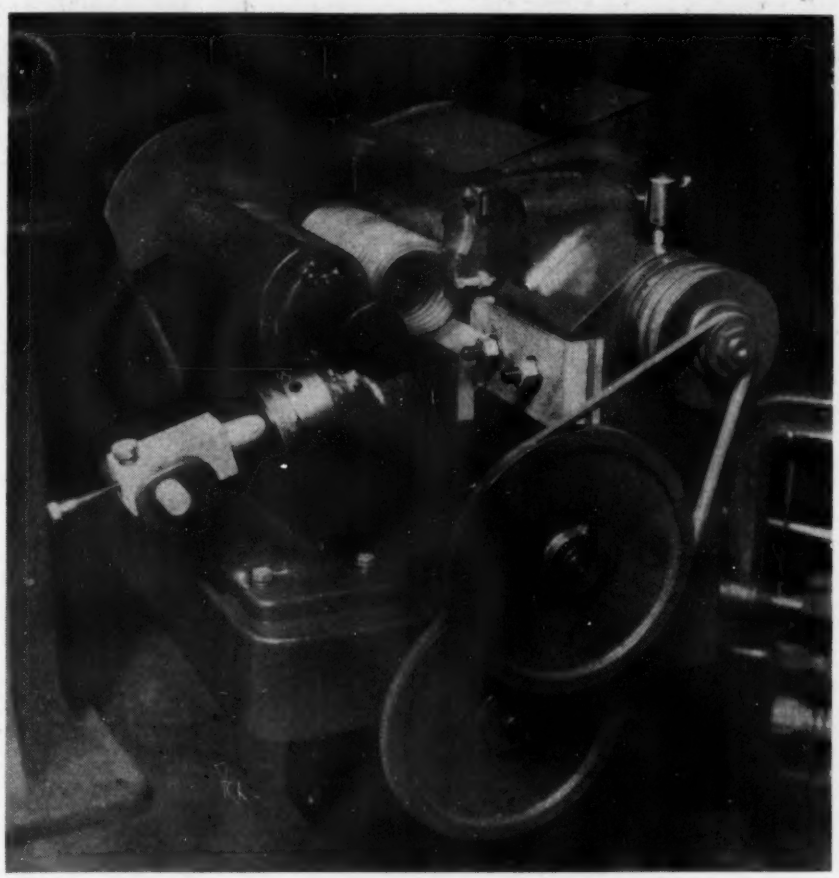
IN MANUFACTURING the Bakelite spool used in an instrument we are making, most of the difficulies encountered in machining this material to extremely close tolerances are overcome through use of a wet grinding process. This process is used during the entire machining cycle, with the exception of one lathe operation.

When this part was first designed, considerations of space and weight required extreme parsimony in materials and dimensions. It was originally a molding. Tightening requirements for accuracy showed that tolerances had to be closed down to ± 0.0005 in. on most dimensions. Attempts were made to machine the moldings by usual methods of short cutting edges and high cutting speeds. Results were far from satisfactory.

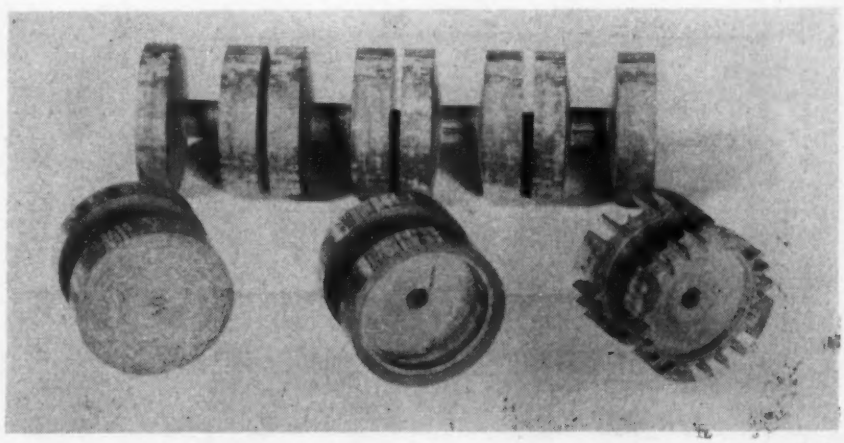
In addition to the machining difficulties, it was found that during storage parts would shrink in some directions and swell in others. Dimensions would change from day to day and considerable warping was encountered. In extreme cases dimensional changes of as much as 0.005 in. were discovered. After trying several other methods and materials for moldings it was decided to attempt wet grinding. This method proved completely successful.

In working out the operations which could be done on the grinding equipment available, we found a few that would have to be done with cutting tools. In these cases, a turret lathe was used with complete success in holding close tolerances by using long cutting edges, low feeds and speeds in some cases as low as 50 r.p.m.

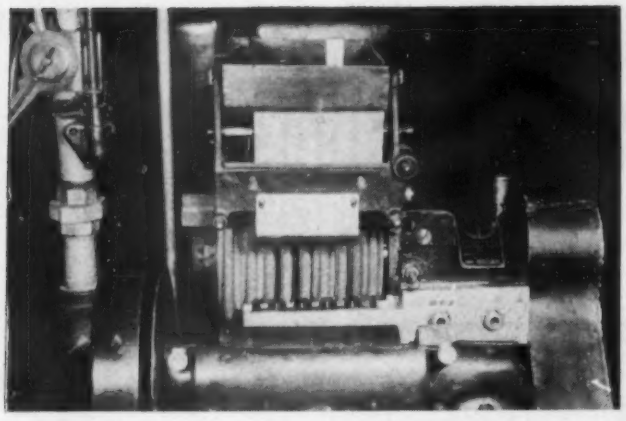
Laminated Bakelite for the spools is received in the form of round bars, 1½ in. in diameter. They are first ground to final diameter in a conventional centerless grinder. The 0.001 in. tolerance is easily kept. The bars are then cut into short lengths, sufficient for five spools, and fed to a specially designed centerless grinder which performs this operation. Five wheels are mounted on a common arbor with spacers to determine the distance between wheels. The wheels are mounted flying, the arbor having only one long bearing, on the right hand side. An



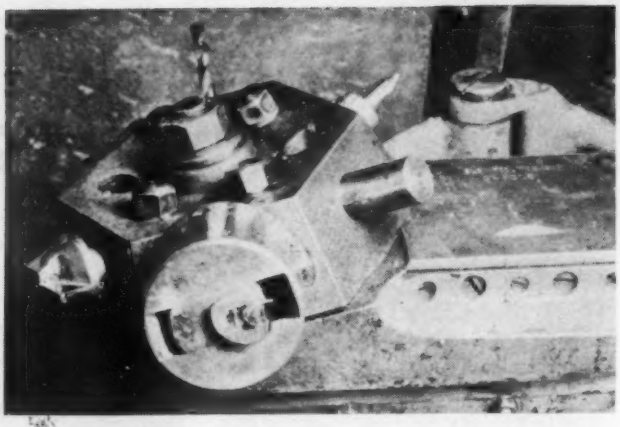
The feedwheel actuated by a profiled cam pushes the workpiece into the formed wheels. Water flows over point of contact between work and wheel



After the form is ground on a special centerless grinder, the head is hollowed on a lathe and then slots are cut on a modified surface grinder



'Formed wheels accurately grind sloping head and shoulder on each spool



Standard lathe tools are used, with the exception of a special form tool

anvil holds the workpiece and a feed wheel pushes the pieces toward the grinding wheels with a positive motion determined by a profiled cam. Pressure required is approximately 200 lb. A steady stream of water flows through the machine and keeps the wheels and work covered during the grinding.

As the work comes from the grinder there is no change in the outside diameter. Sloping heads of the spools are kept within the 0.0005 in. tolerances without much trouble. The grinding wheels also form a 0.015 in. high shoulder on the inside of each of the spools. The machine is fully automatic, as the raw material is fed from a hopper, and produces approximately 30 bars of 5 spools per hour. Wheels used are MM-60 and dressed to size with a mounted diamond the size and shape of a grain of wheat. No chips can be used as the cutting edge must be a natural crystal corner. Dressing of the wheels is relatively easy and is done on a lathe, where each wheel is held by a special fixture to prevent deflection through tool pressure.

Spool blanks come from the grinder joined by a quill, which is broken, as from this point on the blanks are handled individually.

Blanks are placed in a special collet on the turret lathe, where the center hole is drilled and the wheel head hollowed out. All tools used on the lathe are conventional, with the exception of a special form tool. This tool produces the main cavity. During this operation, the lathe spindle rotates at only 50 r.p.m. However, the large cutting edge of the tool makes possible the removal of the required material in a fraction of a minute. The lathe operations complete the spool with the exception of cutting slots in the head.

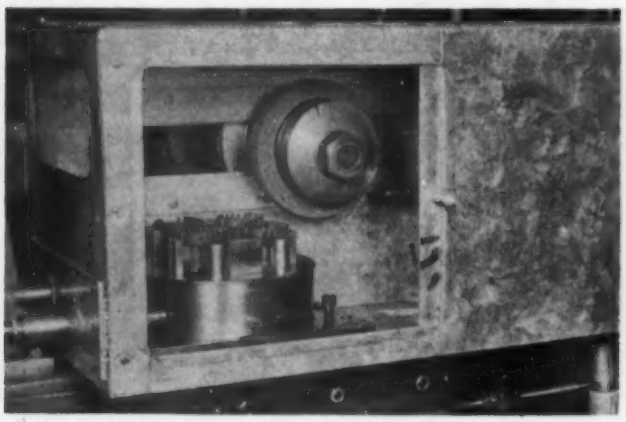
For the final operation, the spools are placed in two fixtures, one for grinding slots across the head and another for grinding slots parallel to the spool's axis. A modified surface grinder is used. Four wheels are used, as a set, to cut four slots at a time. For the cross slots, the fixture holds three spools to be machined in one operation. Two spools are held at one time in the fixture for grinding the longitudinal slots.

Wheels used for these operations are about 6½ in. in diameter and of the same grit as those used in the centerless grinder. Peripheral speed is approximately 6,000 ft. per min. An ample stream of water is directed at the point of contact between wheels and work.

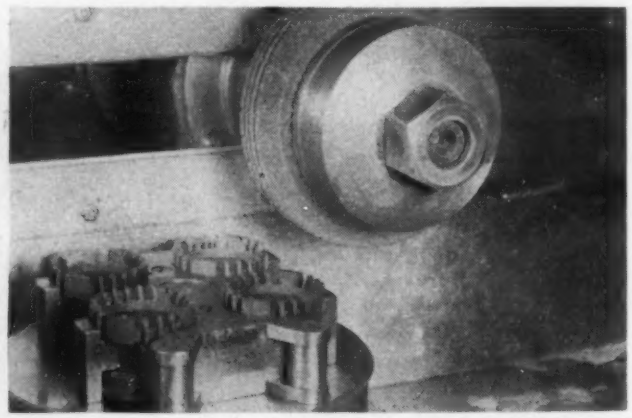
As the Bakelite comes off in the form of a fine flour suspended in the coolant, provisions for settling the sludge are made so the coolant can be reused. For this operation we use a mixture of water with five percent cutting oil.

In this process the spools are always covered by water except during the lathe operation. We have found that dimensions remain perfectly stable in storage. The spool increases in diameter about 0.001 in. during the entire operation. As this increase remains stable machine settings are adjusted to compensate. If all details are properly watched, the process works quite smoothly. Total labor required per spool, for all operations, is between six and eight minutes.

We feel that this process is applicable to any parts where spacings permit a peripheral wheel speed of about 6,000 ft. per min. At lesser speeds results are rather poor.



Slots in the spool head are ground on this modified surface grinder



Water completely covers the wheel and work during the grinding operation

Ideas From Practical Men

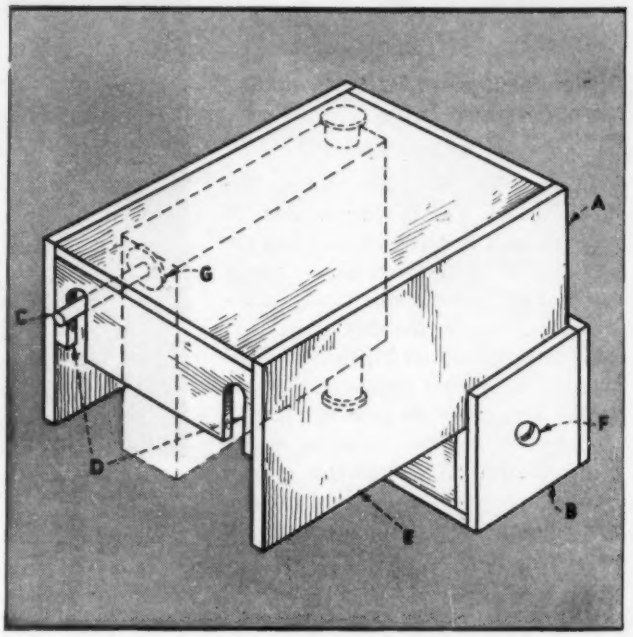
Celluloid Guards Protect Sheffield Gages

BY LOUIS DE L. BERG

We recently put into operation a multiple gaging fixture consisting of several pairs of Sheffield electric gaging heads. As this gage was in constant use on three shifts, it was found almost impossible to prevent thoughtless tampering with the delicate adjustments, all of which were in exposed positions. In order to circumvent this, box-like guards for each pair of gaging heads were made from 1/8 in. thick celluloid sheet as shown in the drawing; one head only is shown by dashed lines—the other head is omitted to avoid confusion of lines.

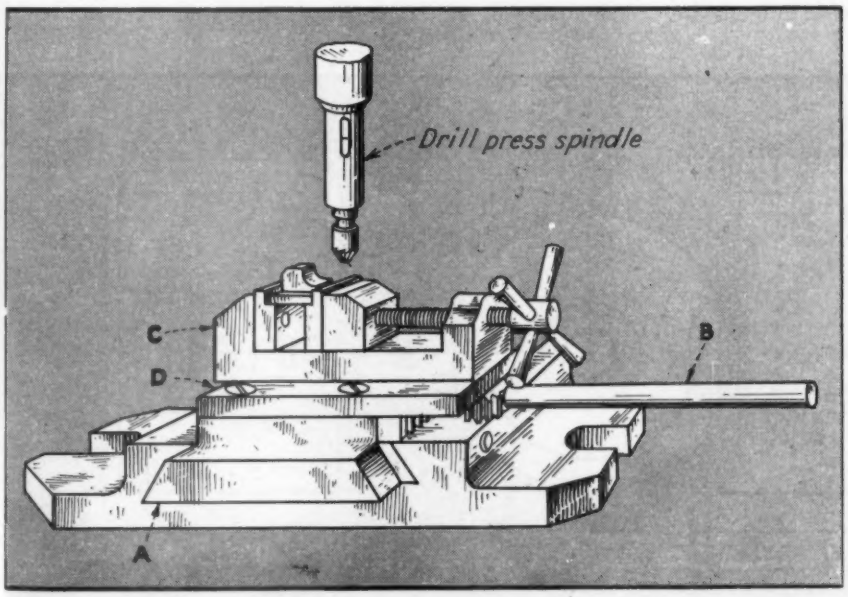
The guard consists of two parts *A* and *B*. Upper box *A* is slipped over the heads with contact fingers *C* of the electric heads projecting through slots *D*. The long lower edge *E* of this box rests on the angle plate (not shown) that supports the heads. With upper part *A* in place, lower section *B* is then slipped over the bottom of box *A* from below and secured to it with screws *F*. After the bottom is screwed on, the complete gage cannot be removed from the heads without removing screws *F*, which naturally would not be done by anyone without authority, unless acting maliciously, in which case it would be detected readily.

Upper half *A* of this guard completely covers contact adjusting nut *G* and the upper micrometer adjusting screw, while lower box *B* protects the lower micrometer adjustment. Although these parts could be made of wood or sheet metal, celluloid is more suitable, since it is nonconductive electrically and is easily worked and joined. Also, the condition of the gaging heads may be observed at all times through the transparent walls. Acetone is used as the cementing agent for joining the sides of these boxes, and is applied with a stiff artist's brush about 1/4 in. wide.



Celluloid guards for Sheffield gaging heads will prevent tampering with adjustments. They are easily formed and joined, the sides being cemented with acetone

The illustrated guard will not of course fit all designs of gages using the Sheffield heads, since practically every gage has its own peculiar style of mounting the heads. However, the basic principle of this guard has many applications, since the openings for contact fingers and wires, as well as the direction in which the cover is applied, can be modified to suit any particular design of gaging head.



This sliding fixture actuated by rack and pinion permits chamfering, burring and surfacing operations to be performed on the drill press

Milling Fixture Designed For the Drill Press

BY PETER L. BUDWITZ

The illustrated fixture is designed for fastening to the table of a drill press, thereby converting it for performing light milling operations. The base of the fixture is made from a standard die holder, and has dovetailed ways machined in it for receiving slide *A*. Vise *C* is mounted to steel plate *D* that is fastened to this slide.

The slide is actuated by a rack and gear arrangement, the rack being attached to the slide. The engaging gear has a flat machined on it for attaching operating lever *B*, which may be either welded or screwed in place. The plate to which the vise is secured covers the rack and gear to prevent chips from entering and interfering with the operation of the fixture. Light chamfering,

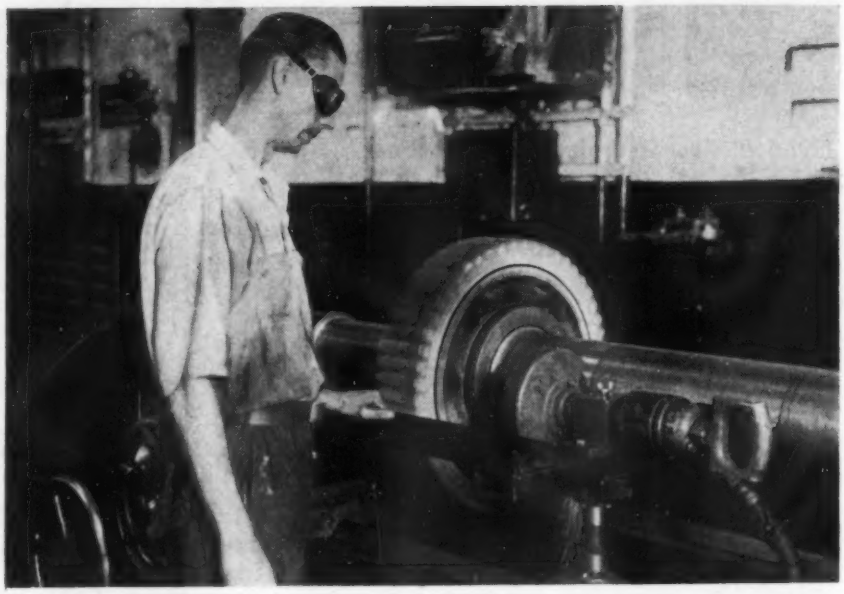
burring and surfacing operations can be performed with this fixture, which otherwise would necessitate tying up more expensive milling equipment for operations of this nature.

Diesel Locomotive Axles Ground On a Standard Lathe

BY L. W. SAGLE

Every effort is made during the shopping of Diesel locomotives to speed repairs in order to maintain the high availability of such motive power in operating service. For example, the inside journals on the driving axles of these locomotives are reground on the bearing fits without removing the gear.

The axle, with the gear in place, is mounted in an axle lathe as shown in the illustration. A portable grinder is mounted in a bracket bolted to a channel-iron structure, one end of which is supported on the lathe carriage. The other end is supported by a column bolted to the underside of the channel-iron structure and to a sliding shoe machined to fit one of the lathe ways.



A rigid channel-iron structure supports a portable grinder on this standard axle lathe for regrinding Diesel locomotive axle bearings

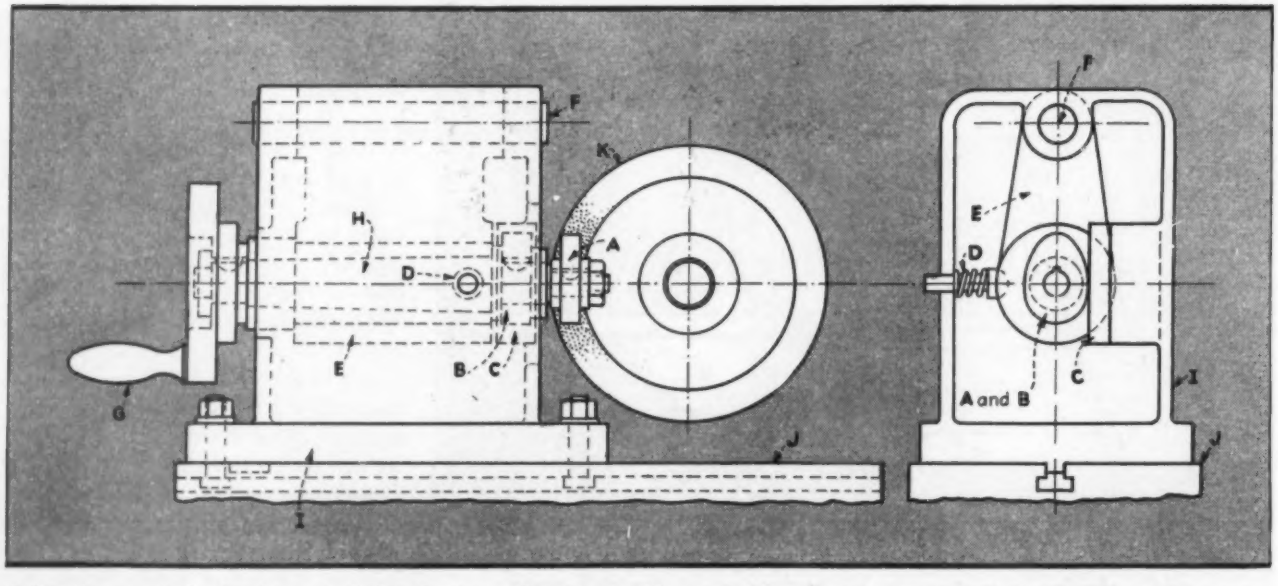
Surface Grinder Attachment for Finishing Cams

BY LESTER J. LALIME

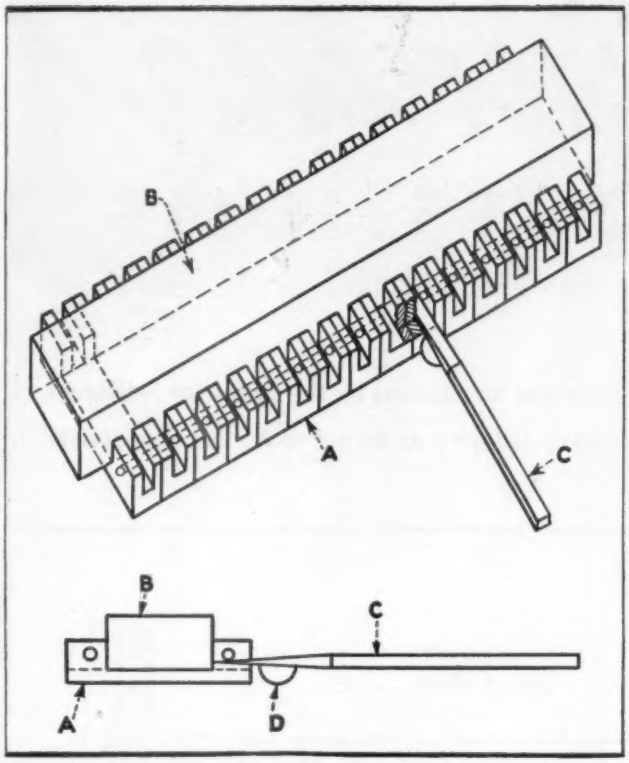
Occasionally a production job of cam grinding comes along in a shop that has no equipment for the work. However, if the shop equipment includes a surface grinder, the problem can be solved by building the illustrated hand-rotated cam grinding attachment.

Cam *A* to be ground is mounted and keyed on spindle *H*. Master former *B*, having the contour to be reproduced on the cam, is also mounted and keyed on this spindle, and is kept in contact with former plate *C* through pressure by spring *D*. The attachment has an oscillating arm *E* that pivots about fulcrum *F*, and a handle *G* by which spindle *H* is rotated manually. Stationary bracket *I* supports the mechanism and is clamped to machine table *J*. Cupped grinding wheel *K* is mounted on the spindle of the machine. The cam is ground by the face of this wheel.

As the spindle is rotated, master former *B* in contact with the flat surface on former plate *C* will oscillate swinging arm *E* back and forth, and the required form will be reproduced on the cam by the flat surface of the face of the cupped grinding wheel. Since the face of the wheel is used, the cam will always be ground by a flat surface on the wheel, and the form will not change because of wheel wear. The stock will be removed from the cam, grinding wheel wear compensated for, and correct sizing obtained through the cross-slide adjustment of the machine.



A hand-operated attachment of this design makes it possible to finish cams to exact contour on a surface grinder



Burrs around the holes in the posts of these parts were removed by inserting the tool in the slot between the posts and pushing it downward

Pointed Lever Simplifies Burring Operation

BY EARL J. BREEDING

Burrs had to be removed from around holes drilled horizontally through the posts on part *A*. Several methods were tried unsuccessfully, including a hand file and a thin grinding wheel, both of which removed either too much or too little material and were exceedingly slow. The problem was solved by the use of steel bar *B* and tool *C*.

Bar *B* fits securely between the two pairs of posts on each part, a number of which are loaded on the bar at one time. Lever scraper *C*, tapered to a sharp edge, is made wide enough to fit snugly between the posts. Heel *D*, spot welded to the lever at a convenient distance from the end, affords leverage for raising the pointed end of the tool after it is inserted between the posts.

The operator holds bar *B* firmly in one hand, and pushes the burring tool into the slots with the other hand, after which the tool is given a downward push, neatly removing the burrs. A small burr is left around the hole, but this is not important since it is removed later in a tumbling operation that is not severe enough to remove the original large burrs. This tool does a better job, and has increased by ten times per man-hour the number of pieces burred by the previous methods employed.

Bar Stock Transferred Vertically to Screw Machines

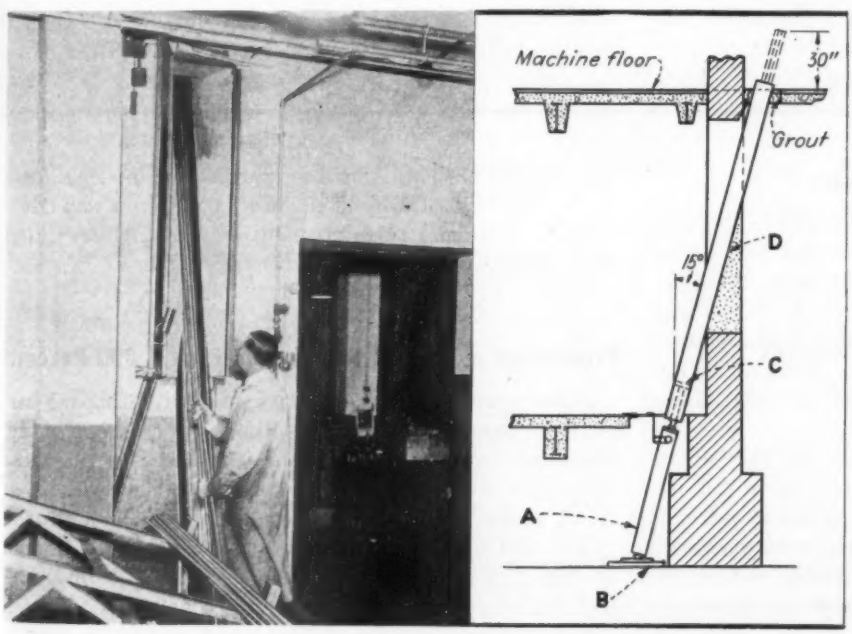
BY T. TURNER
Westinghouse Electric & Manufacturing Company

Where screw machine bar stock is stored in basements beneath the machine floor, an air lift of the type shown in the illustrations can be used to transfer material from storage to the machines. This device eliminates the necessity of tying up a freight elevator every time the screw machine department needs a few bars of stock. It has a lifting capacity of 1,200 lb.

The lift has an air cylinder *A* of 6½ in. bore and 56 in. stroke that is anchored to baseplate *B* below the basement floor. Lift platform *C* is mounted to the upper end of the piston by means of a ball joint. Housing *D* in which the bar stock travels consists of a 15 ft. section of 8 in. pipe in which a rectangular opening 5 in. wide and 10 ft. 10 in. long has been flame cut. A metal door has been fitted to this opening to conform to State fire laws. The piston works at the bottom of this housing.

In use, the stock supply man in the screw machine department inserts his orders into sections of mailing tube which he drops down the housing pipe. Periodically, the stock man opens the door of the housing and removes these orders. He then selects the required material and loads it into the housing. Next he closes the metal door and trips the air cylinder. The bars are then lifted 56 in., which brings them 30 in. above the floor of the machine department. The stock supply man who furnishes material to the screw machines can easily remove them and deliver them wherever required.

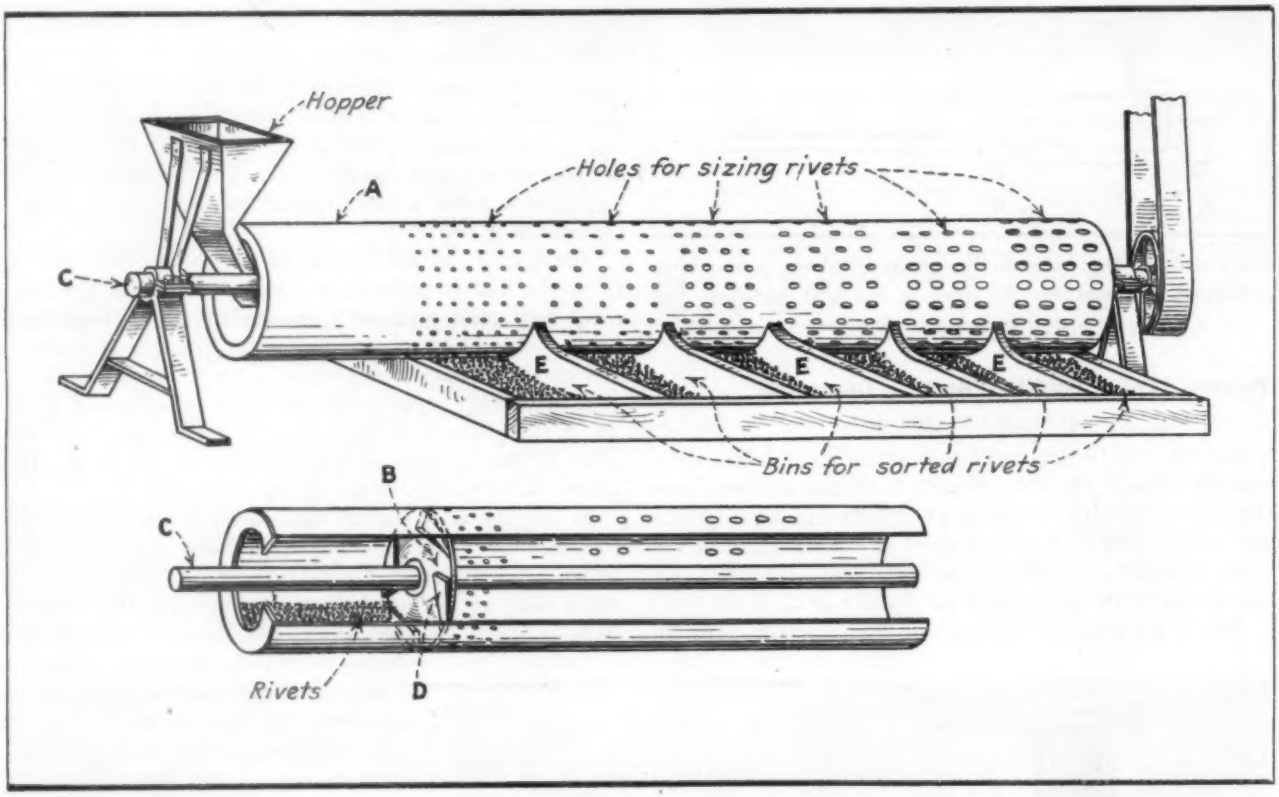
On occasions it is necessary to handle shorter lengths of stock. A jack, consisting of a length of 1½ in. pipe to which is welded a 7½ in. disk of ⅜ in. steel, is inserted in the housing, and bars are placed in the housing above the jack.



An air lift can be used to transfer bar stock from storage in the basement to screw machines on the floor above. It eliminates tying up freight elevators for this work

War Winning SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.



Shop-Made Tumbler Sieve Sorts Rivets

Rivets salvaged in assembly and subassembly shops in aircraft factories have to be sorted into similar sizes before redistribution. This can be done readily with the illustrated device consisting of rotating barrel *A*, drilled with different size holes in the various sections. It is supported by rings *B* mounted on shaft *C* that rotates in pillow blocks. The tumbler assembly is set up with the hopper end slightly lower than the drive end.

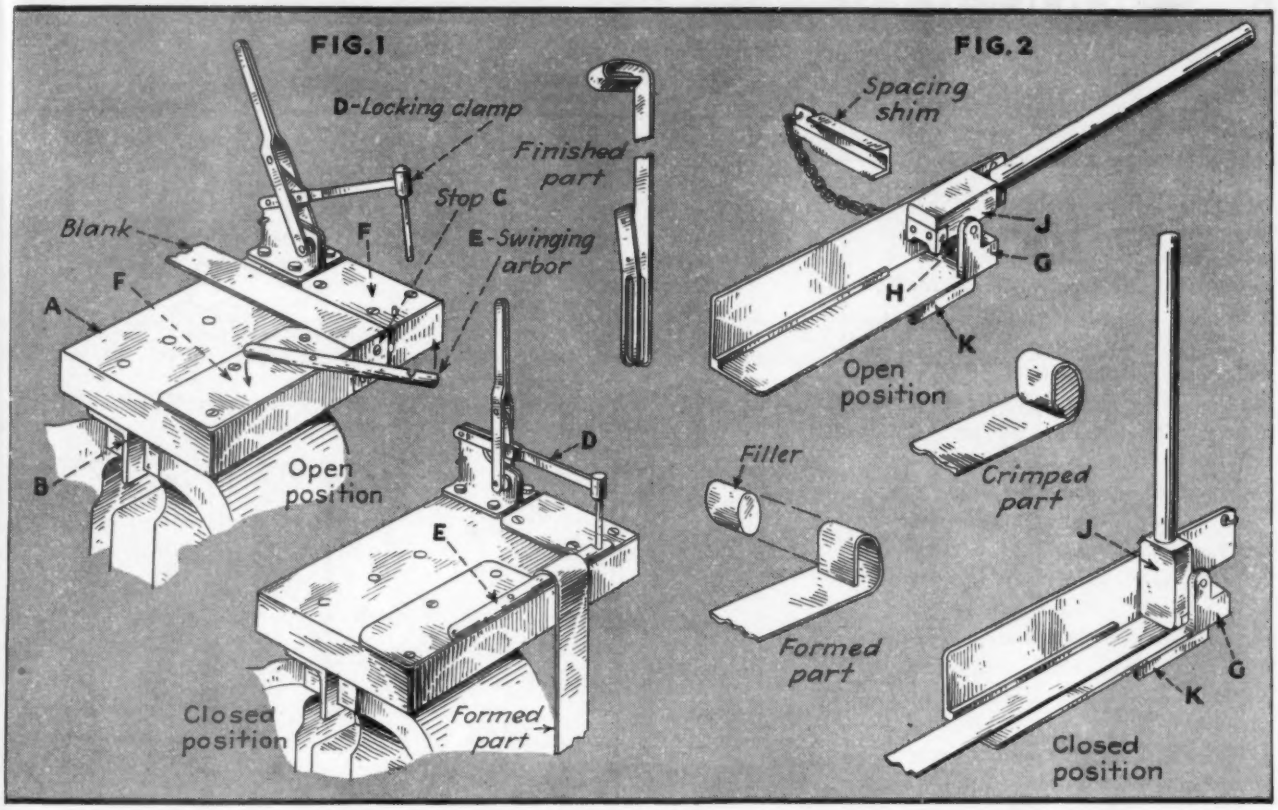
Rivets shoveled into the hopper fall into the section with the smallest holes. Rivets not sorted out in this section are picked up by scoops *D* and passed to the next section. There is a similar ring with scoops between each of the sections. Separation boards *E* between each of the receiving bins are cut to the curvature of the barrel and help support it. This is necessary because of the rivet load.

This device was made in the shop and sorts rivets effectively in minimum time. *Suggested by McClelland Altemeir, Fairchild Engine & Airplane Corporation.*

Production of Looped Straps Increased 1,000 Percent

Metal straps for securing tanks and bottles aboard aircraft are looped at both ends. Prior to the design of the illustrated tools for the forming and assembly on these straps, the work was done on bending brakes with inaccurate results, since the loops could not be held uniform.

The tool used for forming the looped ends are shown in Fig. 1. It is comprised of block *A*, fitted with angle-iron bracket *B* for mounting in a vise; also, stop *C*, locking



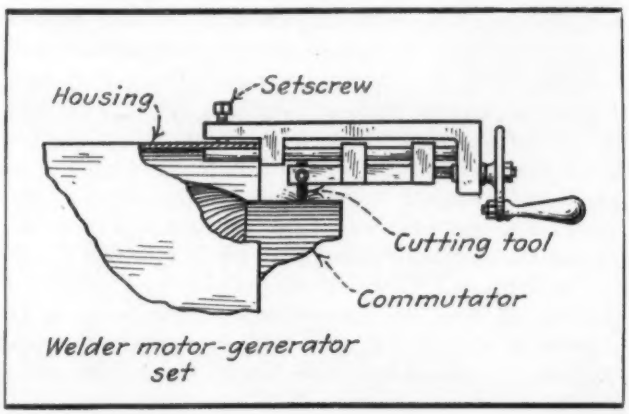
clamp *D*, and swinging arbor *E*, the latter of which has ends shaped to form two sizes of loops. The blank material is placed on the block between guides *F* and against stop *C*. The arbor is clamped over the end of the metal blank, after which the free end of the blank is raised over the arbor, forming the loop. Result—200 parts per hour instead of 20 per hour.

Each strap, after being looped, is assembled with a magnesium block to act as a filler. The corners of the loop are crimped about the block. Formerly, the operation was accomplished by inserting the block and peening the corners of the loop about the block with a punch and hammer. The tooling designed to eliminate this tedious practice is shown in Fig. 2. It consists of form block *G*, stop *H*, and hinged peening tool *J*, and is held in a vise that clamps on tongue *K*. The filler blocks are inserted free in the looped parts and the assembly is placed against the stop. The hinged peening tool is then brought to bear against the part. Both ears of the loop are peened against the block at the same time. The spacer shim is used so that two sizes of straps may be assembled with this device. Production increased from 12 to 120 parts per hour through the use of this tool. *Suggested by Ralph Froelich and W. F. Wellington, Northrop Aircraft, Incorporated.*

Commutator Turning Tool for Welding Sets

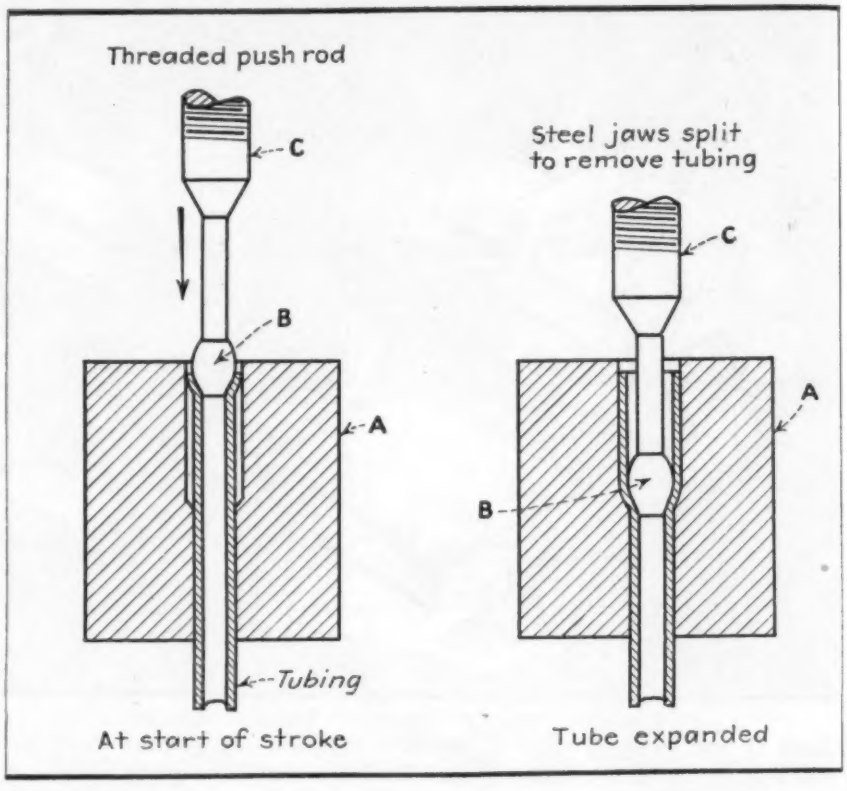
The tool shown in the drawing is used to reduce the time lost in turning and truing the commutator on Lincoln motor-generator welding sets, since it elimnates the necessity of removing the armature from the motor housing and sending it to the electric shop for repairs. It is bolted to the motor housing, after which the cutting tool is set to the desired depth and moved across the commutator until the desired surface is obtained. The tool is fed by a hand-operated screw held in true position by two guide bars.

A commutator can be trued in 30 min. with this tool. The time required to dismantle the welding machine so that the armature could be taken to the electric shop, centered in a lathe, the commutator turned, and the motor reassembled was about 3 hr. and 30 min. This tool is in constant use on the ship ways, and turns commutators more accurately than when done on the lathe, because they can be trued to the actual running condition of the motor. The brushes need not be changed so often, since they are running on a perfect circle. This in turn eliminates voltage fluctuation. *Suggested by Douglas J. Harrington, Kaiser Company, Incorporated.*



Sleeve Joints in Copper Tubing Eliminated

Copper tubing is used between all cargo tanks and the engineer's control board to transmit vapor pressure to gages. On one type vessel there are about 500 connections in this tubing, each of which was made by slipping a short sleeve of oversize tubing over the junction and soldering the sleeve to the tubing. These sleeves are necessarily a loose fit, making soldering difficult and resulting in many leaks. The junctions are quite large, and because many tubes were run parallel and close together through hangers, it was impossible to have two connections next to each other; therefore, the sleeves had to be staggered, which meant cutting standard lengths of tubing unnecessarily.



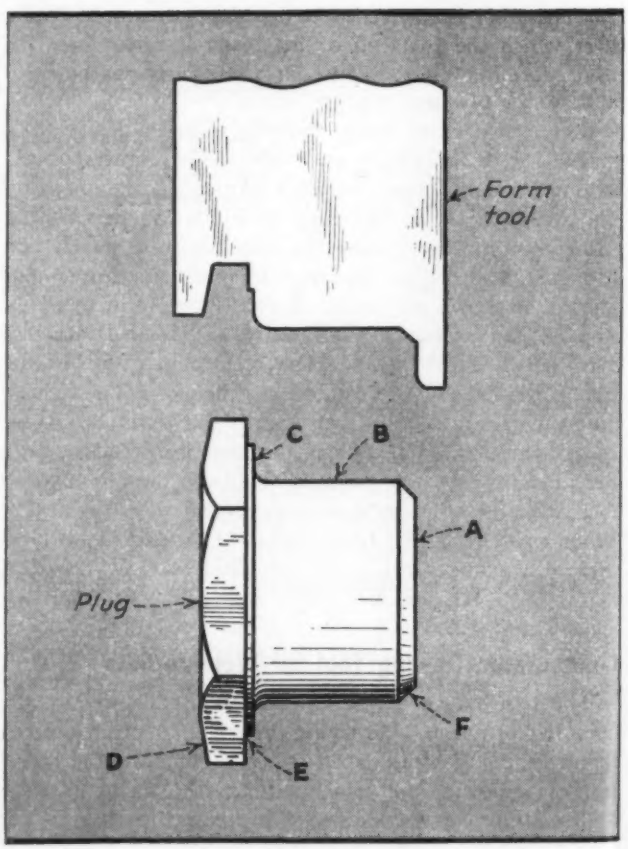
The use of the sleeves has been discontinued, because the illustrated tool makes it possible to flare the end of one piece of tubing for a length of 1 in., and slip the adjoining tubing into it, resulting in a tight fit that can be easily soldered to make a leakproof joint. The tool used consists of clamp *A* and expander *B*. The clamp is split into two halves, is hinged on one side, and fitted with a lock opposite the hinge. The expander is driven by threaded rod *C* that screws into a bracket on the clamp.

This device has reduced by 50 percent the time required to make the 500 joints; also, 50 percent less solder is used, 75 ft. of tubing is saved per hull, and leaks have ben reduced 90 percent. *Suggested by B. C. Hendricks, Kaiser Company, Incorporated.*

Form Tool Eliminates Five Machine Operations

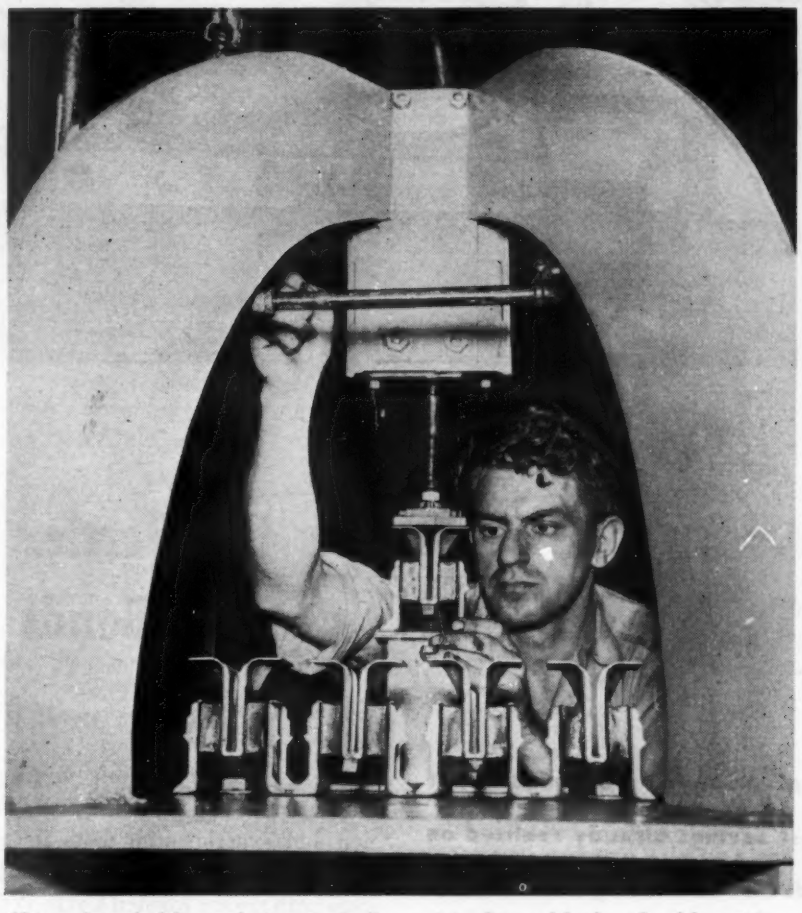
Three of the plugs shown in the drawing are required for each Packard marine engine. Limited production required to meet manufacturing schedules of these engines, made it advisable to machine the plugs on a hand screw machine rather than on an automatic. The part is made from hexagonal bar stock, and formerly one tool was used to face surface *A*, turn *B*, form the radius and face surface *C*. A separate tool was used to chamfer *D*, while a third tool faced surface *E* and formed the step shown at this point. The part was then cut off and held in a collet in a second machine to cut chamfer *F* with a fifth tool.

The form tool shown in the drawing was designed to perform all these operations simultaneously, with the exception of the cut off. All work is now done in one machine. *Suggested by Joseph Stopar, Packard Motor Car Company.*



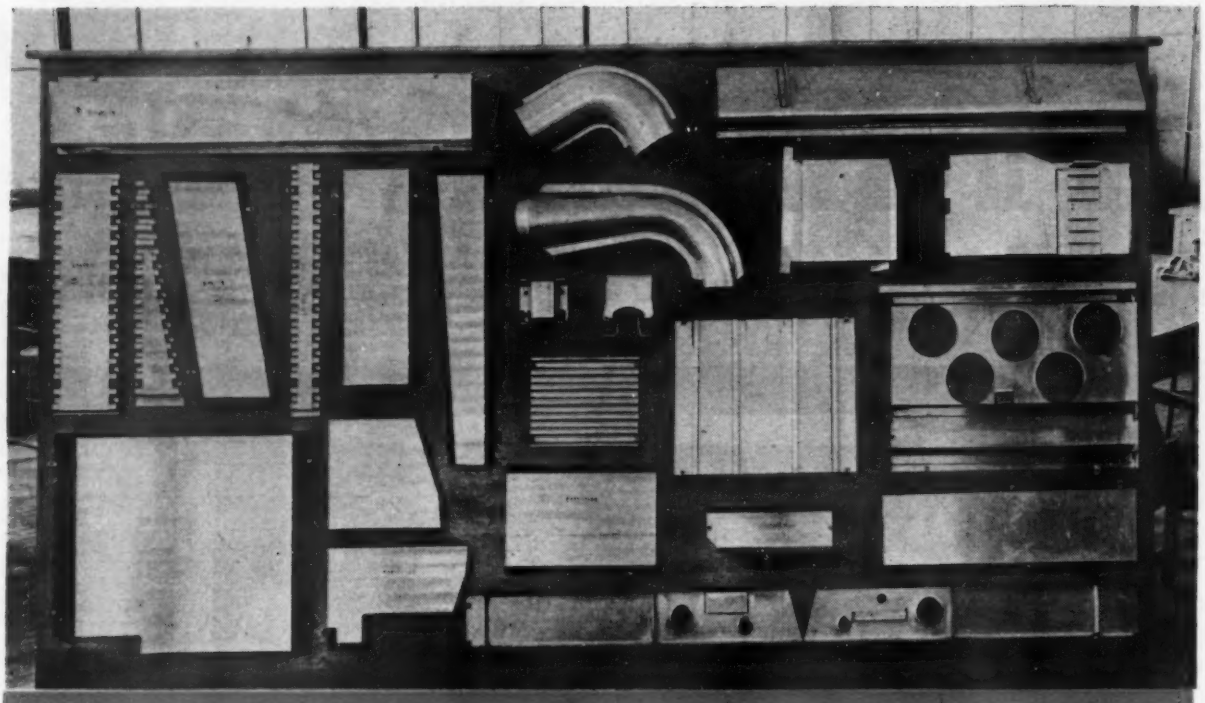
Armament

SECTION OF AMERICAN MACHINIST



Ski pedestals (shown being tested) consist of two blocks of rubber joining the upper and lower steel members. Cycle-Weld cements and bonding procedures have been chosen so that the bond will not fail when subjected to low temperatures

Cycle-Welding Breaks the Barrier To Assembly With Cement Bonds



Representative examples of Cycle-Welded aircraft assemblies show that the process has been largely applied so far to joining plane surfaces although the joint need not be straight

Cycle-Welding Breaks the Barrier To Assembly With Cement Bonds

Aircraft applications now predominate but the time and cost savings already realized on structural products not designed for the process indicate enormous possibilities for new constructions in the postwar period

IMPROVED to meet special wartime needs, a new method of permanently bonding similar or unlike materials is now in use by American industry. Cycle-Welding, as the process is called, is a development of the Chrysler Corporation. Conceived shortly before the war for certain automotive applications, the method is now being used in Chrysler plants to assemble more than 50 components for fighters and bombers. Other manufacturers, operating under license, are using Cycle-Welding in current production and experimenting with its application to new designs of fighting equipment. Nearing the approval stage perhaps are wooden Cycle-Welded airplanes estimated to outperform existing types and capable of manufacture in much less time. Constructional features of the huge bombers projected definitely will incorporate Cycle-Welding because it offers a means of economically producing light-weight composite structural elements more nearly meeting the engineer's requirements.

Cycle-Welding is a process for bonding materials by means of a thermosetting plastic cement or cements applied to the faying, or joint, surfaces. Metal can be joined permanently to metal, to wood, to rubbers, to plastics, to ceramics—and any of the non-metallic

substances can be joined together or to each other. The cements have a high modulus of rupture, permitting wood to metal joints stronger than the wood itself, and the application of shear or tension loads to metal assemblies in the order of several thousand pounds per square inch. Thus, if the load can be distributed, instead of concentrated, Cycle-Welding offers a cheap and convenient assembly method.

Permanency of the bond is attested by the fact that no joint selected for Cycle-Welding has failed under vibration.

In aircraft assemblies, where Cycle-Welding has been applied, no rivets are used in joints, unless there are joggles interfering with continuity of the bond. The most outstanding production application is a fighter wing flap made by Chrysler wherein 900 out of 1200 rivets were eliminated, much assembly time and labor saved, and the cost reduced at least one-third. Even more sensational results have been obtained with certain other aircraft assemblies built with Cycle-Weld methods on an experimental basis. The real value of the process thus will be realized when designers obtain greater familiarity with the process, the various cements available and production men assist in choosing the most economical manufacturing layout. Chrysler started with one cement and one process, now has variants in cements and procedure which have extended the possibilities for Cycle-Welding into unexplored fields.

Thus it can be stated that specifications for a specific application must be developed, considering the materials to be joined, the temperatures the materials will withstand, expansion characteristics of the materials, and manufacturing problems such as tooling and the most suitable method of applying heat and pressure. The following discussion of Cycle-Welding discloses information available as of a recent date, but it should be kept in mind that further cements of suitable modulus, and perhaps requiring very little heat and pressure may become available.

Cycle-Weld cement is applied in a grid pattern to the skin of a wing flap, using a flow gun. Later the skin and the rib assembly are bonded together at the glue lines by applying heat and pressure in a large hydraulic press. Seventy-five percent of the rivets formerly used are eliminated by Cycle-Welding this assembly

Three Processes Available

To broaden the scope of Cycle-Welding, the Chrysler Corporation now has three general processes: (1) the original Cycle-Welding method, (2) Cycle-Bonding—low temperatures and (3) Cycle-Bonding —medium temperatures.

The Cycle-Weld process is adequate for manufacture of many assemblies of wood to metal, metal to metal, rubber to steel, plastics to each other and any of the other materials mentioned. But there are reasons why alternate procedures are of value. For example:

1. Metal surfaces with commercial finish may be joined, but should be relatively free of waviness and dings. The pre-cured Cycle-Weld cement does not

flow readily in the curing process. If heavy pressure must be applied to achieve intimate and complete contact over the bond area, the residual stresses in the metal may "pop" the joint.

2. The bonded surfaces should preferably lie in a plane, although the joint need not be straight. It would be difficult to apply high pressure evenly to one dished component nested into another.

3. With any but simple joints, tooling problems are complicated. Clamping fixtures or press tools are costly to build for odd-shaped or complicated assemblies. In such cases, curing becomes a problem.

4. The curing temperature and pressure for Cycle-Welding are deleterious to some materials, and create problems with materials or assemblies subjected to sub-zero temperatures.

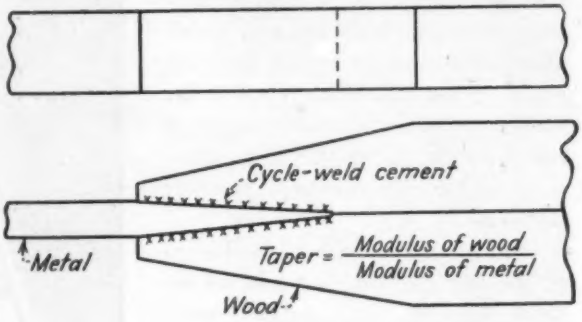
These considerations prompted the development of the two newer processes, which use intermediate cements to join parts pre-coated with Cycle-Weld cement.

Cycle-Bonding—Low Temperature. This process uses low temperature and medium pressure to effect the bond. It was developed specifically for joining dissimilar materials by what amounts to cold gluing practice as a means of avoiding troublesome tooling problems, and to avoid the ill effects of high temperatures on certain materials.

In a wood-to-metal assembly, the metal is coated with Cycle-Weld cement which is cured. A Cycle-Bond cement is spread upon the cured Cycle-Weld and upon the uncoated wood surface. Components of the assembly are then brought together with pressure and low heat. The low-temperature cure avoids warping the wood as the result of residual stresses, and the intermediate cement has the feature of taking up surface irregularities. Once one face of a wood member is Cycle-Bonded to a metal connection, the other wood face can be glued to a wood structure.

Cycle-Bonding — Medium Temperature. Other fields for the Cycle-Welding process are those in which low pressure is essential but medium temperature can be applied to the materials joined. Another Cycle-Bond cement fits into this category for joining parts of odd shape, heavy gage or considerable surface irregularity. Similar or dissimilar materials may be joined, providing both have been given a coat of Cycle-Weld cement that has been cured.

In this phase of the art, the Cycle-Weld cement is applied to the members to achieve maximum adherence to the metal and minimum creep. Then the coated surfaces are joined with Cycle-Bond cement which has a higher modulus, and hence the increased thickness of the cement joint does not reduce the strength of the assembly. In other words, Cycle-Bonding avoids need for close-tolerance material, and opens up new fields for laminated assemblies. It should be possible to roll half-round sections of considerable length, coat them in the manner described and bond nested sections by application of moderate pressure. New-type light-weight structural elements are therefore a commercial possibility.



With this type of double scarf joint, the wood will fail before the cement. Hence the full strength of the wood may be used in calculations of wood-to-metal joints

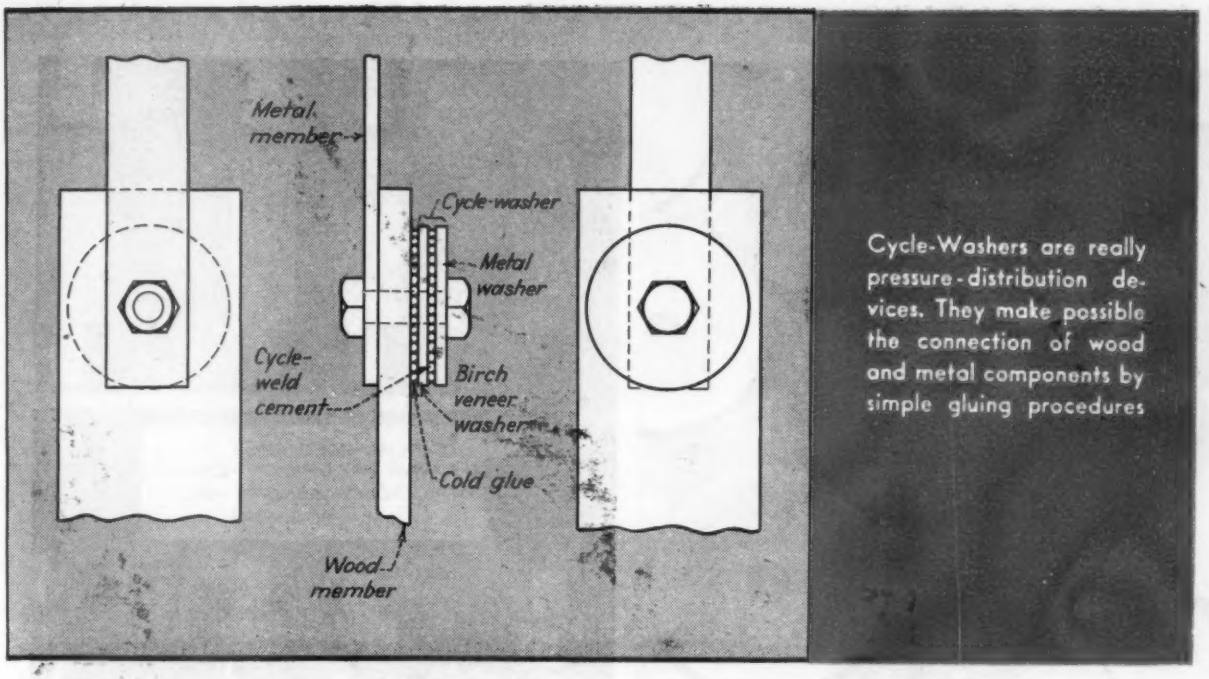
Efficiency of Lap Joint

Studies of Cycle-Welded lap joints reveal the following facts:

1. The basic factors controlling the efficiency of bonded lap joints are: *(a)* uniform elongation of the combined members over the entire length of the joint, and *(b)* the amount of eccentricity between the members.

2. The best joint is the scarfed variety in which the members have equal cross-sections and equal moduli of elasticity. Symmetrical alignment of the members and constant section combine to provide uniform elongation and loading over the entire length of the joint.

3. For materials of unequal modulus, a satisfactory scarf joint is produced by lapping the members symmetrically in inverse ratio to their moduli. Thus, in the case of wood bonded to aluminum, the members would be scarfed to a taper of $\frac{1.5}{10}$; for wood to steel, $\frac{1.5}{30}$. To secure symmetrical construction, a double-scarf joint would be required.



Cycle-Washers are really pressure-distribution devices. They make possible the connection of wood and metal components by simple gluing procedures

4. To eliminate stress concentration in elements of the joint, and to promote uniform elongation of the two joint materials, the members must be tapered in thickness but not in plan.

Wood to Metal Joints

Deformation of a Cycle-Weld lap joint under load is complex and is not subject to simple methods of measurement. Elongation depends upon lap length, thickness of cement film and stiffness of the members joined, in addition to the stiffness of the cement itself. Elongation arises from axial strains in portions of the members adjacent to the bond and their relative displacement from shear deformation in the cement. Therefore the stiffness factor, or modulus, determined for a particular joint cannot be applied directly to a joint of different dimensions or other materials.

Cycle-Washers

Another method of distributing the load when connecting metal to wood lies in the use of Cycle-Washers. These consist of a $1/16 \times 1\frac{1}{8}$-in. Alclad washer bonded to a 1/32 in. veneer washer with Cycle-Weld cement. The wood face of the Cycle-Washer is cold glued to the wood member of the joint. Then the metal member is connected by a bolt or rivet passing through the Cycle-Washer.

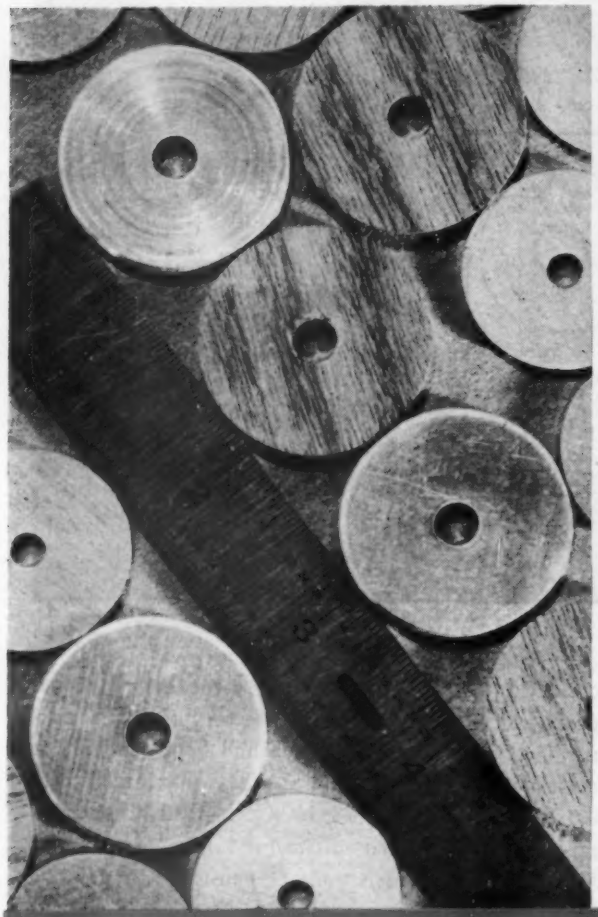
Application of Cement

Metal surfaces must be cleaned before Cycle-Welding. The Cycle-Weld cement may be applied to cleaned metal, sanded wood, or solvent-wiped rubber parts by the method most satisfactory to a manufacturing layout. The spray gun and flow gun are the most common applicators, but a gear-pump applicator or a spreader can be used. Cycle-Weld cement in tape form has proved satisfactory in some instances. Where parts or panels must be painted before Cycle-Welding, the bond area is masked with Scotch tape. Cement from the Scotch tape must not remain on metal surfaces to be Cycle-Welded.

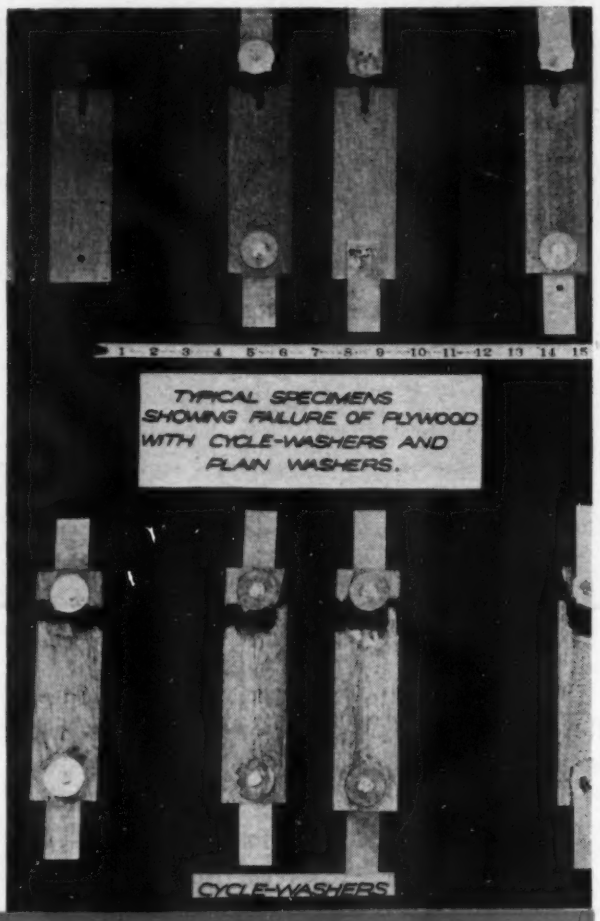
Uniform Film Thickness

The problem in applying the cement is to achieve an even film of the desired thickness. Use of too much cement in the bond may give rise to creep under load. By training, an operator can learn to apply a suitable coating with a spray gun, a process that requires several evenly stroked passes over the work. A flow gun produces the required film thickness in one pass and with more uniform results, and hence is preferred by Chrysler Corporation. Application of cement in tape form does not wet the material quite as well as the spray or flow gun methods, but the ease of handling tape and the saving in drying time are often worth while. Hand brushing the Cycle-Weld cements is not satisfactory because of the difficulty of making the material flow properly and of obtaining an even coating of the proper thickness for a satisfactory bond.

Cycle-Weld C-3 cement is made in two forms: regular for all conditions of shop atmosphere and



Thin birch veneer is bonded to metal to form a Cycle-Washer, or laminated sheets may be made up and die-cut to required size and outline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TYPICAL SPECIMENS SHOWING FAILURE OF PLYWOOD WITH CYCLE-WASHERS AND PLAIN WASHERS.
CYCLE-WASHERS

If the load can be distributed, as by means of a Cycle-Washer, wood plywood panels can be utilized for many structural purposes, including aircraft

humidity when used in a gun applicator, flow gun or spreader, and for spray-gun application under certain conditions of temperature and humidity. A high-humidity type of cement is suitable for spray-gun application under all conditions of temperature and humidity. The regular cement is most often caused to set up by an air dry, followed by a low-temperature bake for a short interval. Heat for drying may be supplied by an oven or infra-red lamps.

Assembly and curing introduce tooling and heat problems, especially if the part is large or intricate. Cycle-Bonding (medium temperature) and the newest process, utilizes low pressure but may not escape all distortion problems. Tooling problems are a minimum with Cycle-Bond (low-temperature) because the medium pressure permits gluing practices to be followed.

Small assemblies are conveniently produced by quick-acting clamp fixtures that embody cartridge heaters at points adjacent to the glue line. The ski pedestal is a case in point. This assembly utilizes rubber bonded to opposing steel members and stressed in shear to absorb the impact of a glider landing on snow. The two small blocks of rubber in the device must be able to absorb an impact of several thousand pounds without rupturing the bond—even under sub-zero conditions. Rubber and steel components of the pedestal are joined with a certain cement at a pressure of only 25 lb. per sq. in. The proper temperature is supplied by cartridge heaters.

Manufacture of the ski pedestals is a mass production job and hence the many assembly fixtures are arranged on a long bench. Bimetal thermostats proved unreliable for controlling the temperatures

provided by the cartridge heaters in the assembly fixtures. Therefore, all fixtures are made identical in mass to consume identical wattage, and are connected in parallel to obtain uniform voltage. One or two fixtures are selected as pilots and two or three thermocouples are applied to these pilot fixtures to operate a potentiometer that controls the contactor in the power imput line. Close heat control is obtained in this way at all fixtures in the group.

Most Cycle-Welding jobs involving assembly of metal to metal, or metal to wood or rubber, have so far been handled on hydraulic power presses or hydraulic platen presses because these machines provide an adjustable dwell period for curing under pressure. One platen is made the hot side, and the other platen may be fitted with locating blocks or pads to position the work, usually the reinforcing members. Thus in loading, the reinforcements such as corrugated sections, flanged members, or rib assemblies, are positioned on the lower platen. Next the skin or panel is laid in position and pressure distribution pads are placed along the Cycle-Weld joint or joints. Finally the heated platen is brought down for the curing cycle. Most die and platen constructions developed to date are relatively simple, as can be seen from examination of the parts produced by Cycle-Welding. Chip board serves adequately as a pressure distribution pad for many jobs, but is good for only one curing cycle. The nature of the assembly may, however, prevent the use of chip board and hence more durable materials may be required. Air bags have been investigated for the assembly of contoured parts.

Pressure Pads

In Cycle-Welding, some means must be provided during the bonding process to equalize or take up differences in sheet and cement-film thickness, as well as variations to platen surfaces. Variations in gage of aluminum sheet amount to as much as 0.005 in.; the variations in cement-film thickness to as much as 0.001 in. Normal variations in platen closure must also be taken up.

Pressure-pad materials should have the following physical properties and characteristics:

1. Resiliency, but not enough to allow the parts to slip or move during the bonding operation.

2. The entire bonding area of the pad must possess uniform deflection characteristics, and no hard or soft spots to concentrate pressure.

3. The pad material must not exude any substance having an adverse effect on the cement of materials being bonded.

4. The pad must withstand continuous curing temperature and intermittent pressure applications without pronounced change in physical properties or actual deterioration. Note: pads made of wood veneer, paper, sheet asbestos and chip board are intended for a single curing cycle and are then discarded.

5. The material must be of uniform thickness.

6. The material should not take excessive permanent set.

7. The pad must remain tack free under curing conditions to permit easy removal of the work from the dies or fixtures.

8. Marks of the pad, stains and disfigurement of materials being bonded are objectionable.

Materials that have been found satisfactory for pressure pads are listed in descending order of their efficiency. These results have been compiled from tests upon scores of materials and pressure-pad constructions.

1. Galvanized-iron wire sheath woven around ¼ and ⅛ in. heat-resistant rubber or synthetic rubber.

2. Flattened steel tube or fabric-covered high-pressure fire hose, using oil, glycerin or inert gas as the fluid-pressure media. A hollow upper platen faced with a 0.010 in. steel diaphram has been used for special applications.

3. Glass tape, ⅛ in. matt weave, or flat weave, enclosed in 0.010 steel envelope.

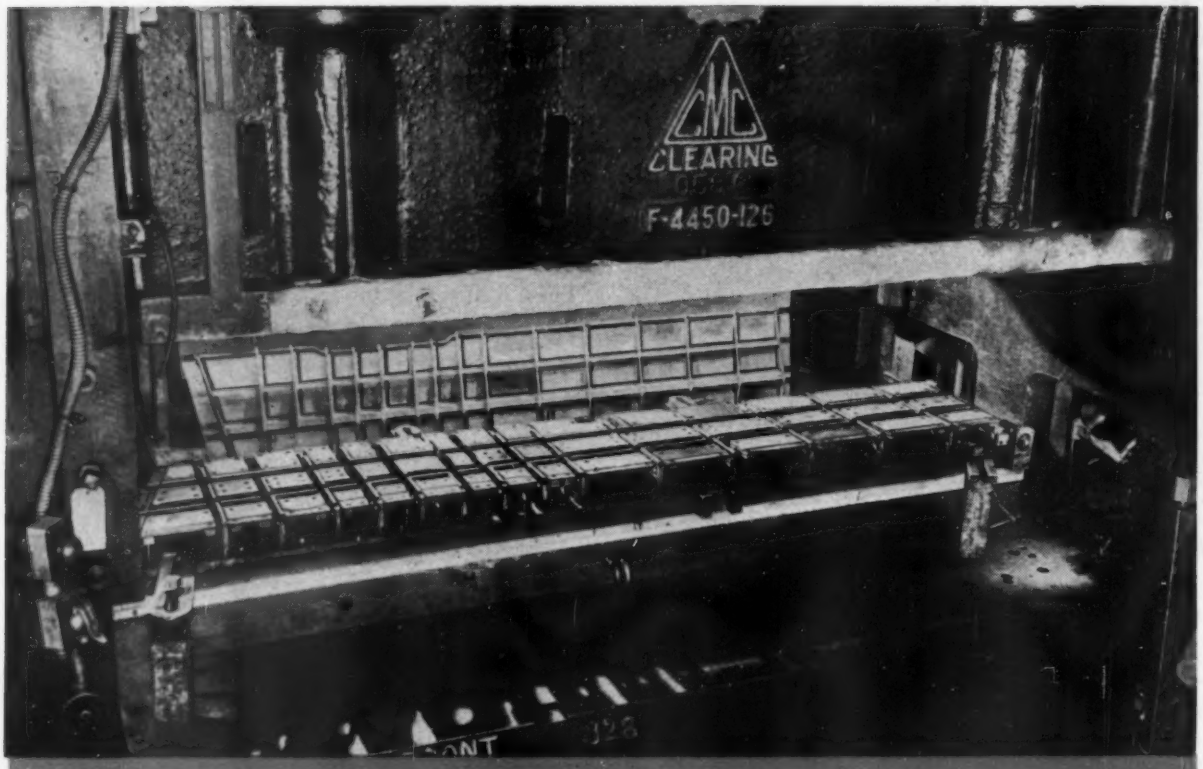
4. Fabreeka No. 9 synthetic rubber-cloth laminate in gages from 3/32 in. through ¼ in. This material is made by the Fabreeka Products Company.

5. Disposable materials such as kraft paper, wood veneer, chip board and asbestos paper.

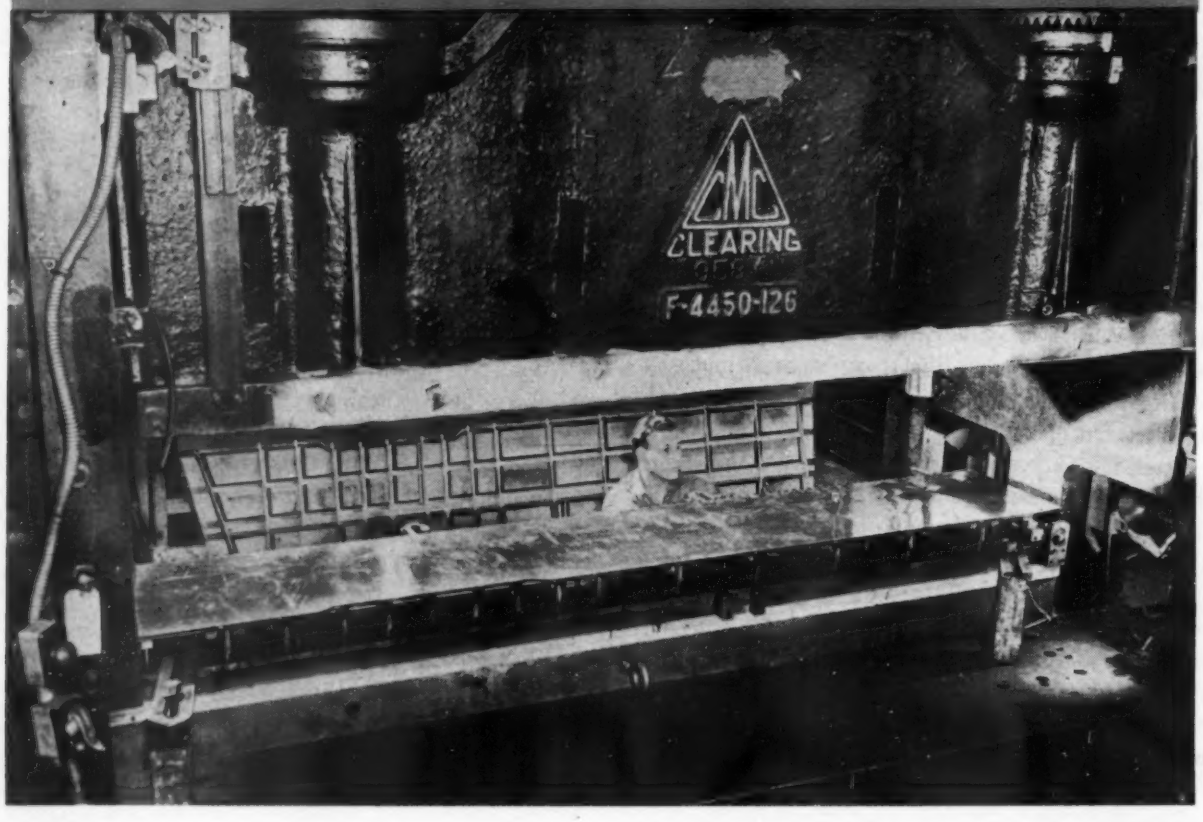
Strength of Scarf Joints Wood to Metal

Shear strength	1600 lb. per sq. in.
Ultimate tensile strength	1600 lb. per sq. in.
Impact strength	3.2 lb. ft. per. sq. in.
Fatigue failure	None under vibration

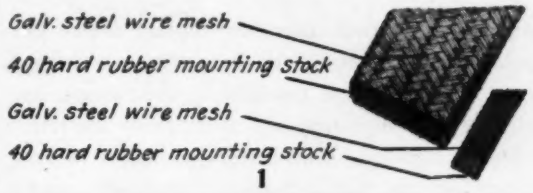
These values are for any metal joined to spruce or Douglas fir. Stronger woods such as walnut and mahogany will give strengths up to 2200 lb. per sq. in.; birch up to 2500 lb. per sq. in. The ioads obtained with a scarfed joint are higher than would be expected because the load is distributed over the fibers.



Complex assemblies like the wing flap require tooling that will apply pressure correctly, compensate for product distortion while at curing temperature. Segmented spring-mounted pressure pads in this case nest the grid-like rib assembly and the skin is laid on top



Suitable types of pressure distribution pads are numbered in descending order of efficiency with respect to number of cures. Not shown are such materials as chip board which is highly useful as a pressure pad for many Cycle-Welding operations



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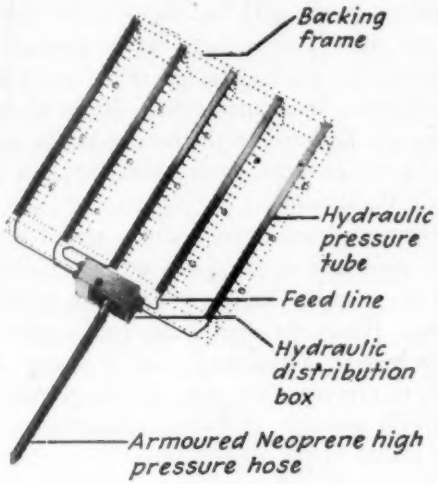

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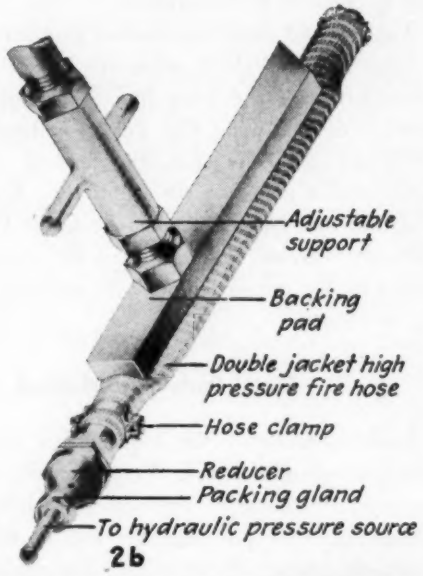

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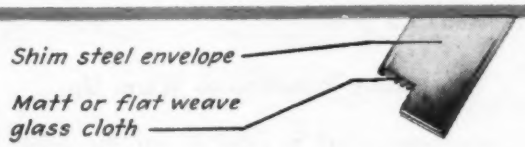

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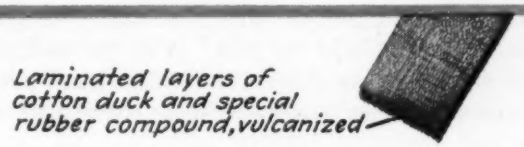

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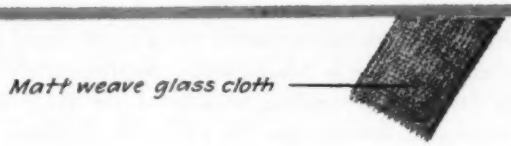

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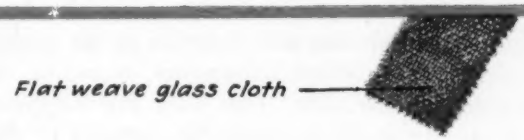


5b

Items 1 to 4 will withstand more than 50 cures. The degree of contact area achieved with these pressure-pad materials ranges between 95 and 100 percent.

A pressure pad having the described qualities will take up a combined difference of 0.020-0.030 in. This rule does not apply to thin pads, such as paper or to hydraulic pressure devices. Paper or sheet asbestos pads are used mainly in conjunction with segmental spring-loaded dies, and where the metal gage is 0.020 in. or less. The die aids considerably in taking up differences in sheet and cement-film thickness. Matt-weave glass cloth, asbestos sheet and chip board have proved satisfactory for aluminum sheet up to 0.045 in. thick. Heat-resistant rubber covered with a woven galvanized wire sheath will give hundreds of cures when bonding gages from 0.052 in. to 0.125 in.

The purpose of a pressure pad is merely to obtain intimate contact of the work surfaces coated with Cycle-Weld cement, not to effect a cure. The thicker the gage of metal the greater the unit pressure must be. Sufficient pressure must be used per square inch with the original Cycle-Weld cement

in order to obtain minimum non-contact area. On the other hand, boosting the pressure to overcome waviness in heavy-gage material is the wrong approach, for the joint may rip apart from the effect of locked-in stresses. The better method is to take advantage of the Cycle-Bonding processes, which utilize a filler cement to overcome irregularities in mating surfaces of workpieces.

Tooling and distortion-control problems in making a large Cycle-Welded structure are illustrated by manufacture of the wing flap for a fighter. Components of the wing flap (as assembled by Cycle-Welding) are; the skin, the leading and trailing edges, and a grid-like rib assembly. Much production time and labor are saved by Cycle-Welding this assembly, because 900 out of 1200 rivets are eliminated by the cement joints. In addition, the assembly is stronger.

Metal Parts Are Masked

Joint surfaces of the leading and trailing edges are sprayed with Cycle-Weld cement, and mating surfaces on the skin are coated with a flow gun. These parts are put together and cured in a large hydraulic press. Next a grid-like mask is applied to the skin to block off the areas that will be bonded to the upper flanges of the grid. With the mask in place, the skin is zinc-chromated. The mask can now be removed and the bare metal strips coated with a flow gun.

Actual joining of the grid to the skin presents a number of problems connected with proper heat flow into the cemented areas and distortion of the assembly as a whole, as the consequence of raising to curing temperature. The 10-ft. wing flap lengthens ⅛ in. and twists ¾ in. under the influence of the curing heat. Obviously the upper and lower dies must be made to compensate for this distortion so that the work produced will not be bowed, wrinkled, misregistered or possess locked-in stresses that preload the Cycle-Welded joints.

Conduction is the best method of applying heat to an aluminum assembly of this character. The upper die is made the hot side, the lower die the cold side. Dimensions of both dies are calculated to reproduce conditions when the wing flap assembly is heated to curing temperature. Thus, the lower die is made to the hot size of the assembly, and the upper platen is dimensioned so it will grow to the hot size of the work. Since steel expands half as much as aluminum, the upper die is made 3/16 in. longer than the cold size of the work.

Pressure applying elements in both the upper and lower dies are contoured to the work in the hot state. The lower die consists of a number of rectangular spring-operated pressure pads that enter openings in the grid and support the upper flanges of the ribs. Top surfaces of the pressure pads are fitted to the work. The upper die has a number of metal strips fitted into keyways in the platen. These strips are Kellered to the outline of the wing in the hot state, and they bear upon the skin above the Cycle-Weld joints.

Heating elements are actually placed in both dies. The main spar in the grid is a heavy U-shaped channel that rapidly dissipates heat from its Cycle-Weld joints. Hence the channel fits into a nest embodying strip heaters. Glass-wool cloth is placed around the nest to prevent dissipation of heat to other parts of the grid assembly. Eighteen strip heaters 5 ft. long are placed in the upper platen, being closer together near the edges than at the center to overcome the effect of radiation. Transite board 2-in. thick is interposed between the platen and ram to avoid dissipation of heat into the press.

Assembly Permitted to Warm Up

A warm-up period is required for the assembly before the press can be closed. Hence the upper die is brought down within 1/16 in. of bottoming for a timed interval. Subsequently the press is closed and the curing cycle is commenced. Approximately 45 tons pressure is required because of the large area of cemented surface and the effort to compress the spring-loaded pressure pads.

Complicated tooling has proved effective in this case but the basic consideration in developing the two Cycle-Bonding processes has been that of broadening the scope of the Cycle-Welding method and reducing manufacturing and tooling problems. Each of the three processes of course has its own field and overlaps to an extent on the others. One thing is certain, if the load can be distributed the joint can be cemented. From that point on designers and production men must cooperate in analyzing a particular job and the most suitable manufacturing layout.

Enemy Weapons Show Effect Of Critical Material Shortages

By JOHN HAYDOCK. Managing Editor, American Machinist

MILITARY MATERIEL now being used by enemy nations is definitely poorer in quality than it was six months ago. This is particularly true of German equipment according to studies being made on captured weapons by the Foreign Materiel organization of the Ordnance Department. Lt. Col. Jarrett, chief of the Foreign Materiel Branch, spent over a year with the British Army in North Africa collecting such items. At present, specially trained crews operating under his direction in the various theaters of war, keep in close watch for new enemy ordnance on the battlefield and send interesting exhibits to this country. In addition they prepare spot descriptions for immediate use in the theaters of war in which they are stationed.

Brass Cartridge Cases to Stovepipes

The Germans are well known for their use of ersatz, or substitute materials, to fill gaps in their resources. An example is the steel cartridge cases now being used by them. Their first step was to use brass-plated steel, all-brass cases having long ago disappeared. Despite the protective coating this material corroded rapidly. The next step was to make all-steel cases similar to those now made successfully under the direction of the Ordnance Department in this country. Still a further step was to make the cases from strip steel wound helically, a construction resembling some stove pipes. These cases are not even welded; the joints permit the entrance of moisture into the propelling charge, giving unreliable ballistic properties. Their use indicates a shortage of power presses, used for making drawn steel shell cases—probably a result of the repeated bombings of German industrial centers.

The poorer quality of steel in projectiles results in inferior fragmentation of high-explosive shell. Good steel when used for this purpose allows the explosive charge to build up to an extremely high pressure before it gives way so that when the shell bursts it throws steel fragments violently in all directions in a uniform pattern. If the fragmentation is poor, the pieces are larger, the explosion less violent, and large holes in the pattern reduce the destructive effect. Italian shells were worse.

German workmanship is also inferior in many cases. For instance, welding beads between tank plates will often come lose in a long strip when struck by a hammer, showing that poor electrodes are used, the work is done too fast and by labor that is not interested in the quality of its work.

The Germans have been noted for their optical instruments, and their fire-control equipment has good optics. However, the controls are often complicated by adjustments that would not be tolerated in this country. These arrangements permit inaccuracies through fautly handling or through the entry of dirt into the equipment.

Anti-tank rifles have been developed by the Germans following the reducing bore principle which has been known in ordnance work for many years. These guns use a jacketed projectile in a bore of a gun which starts at 28 mm. and is tapered down to 20 mm. This choking effect is said to develop extremely high muzzle velocities. However, the gun is very expensive to make and has an accuracy of only 500 yards. Even when it is fired successfully it merely makes a pinhole in the tank. The weapon is at best a supplementary arm used when every other means of repelling a tank has failed. The barrel is good for only about 50 rounds and for this reason four spare barrels are usually issued with each gun. The United States Ordnance Department tested a similar design ten years ago and decided against its adoption.

NOT WHAT THEY USED TO BE

The much vaunted mechanical prowess of the German army does not stand up under the careful scrutiny of U.S. Army Ordnance engineers. The tanks and guns, used so successfully in Poland and France, are not what they used to be. Germany's bankruptcy in strategic materials is now being felt at the front. The Foreign Materiel Division, at Aberdeen, tears down and carefully inspects captured enemy weapons, hoping to learn something constructive that may be incorporated into our own arms. But the outstanding finding is the poor quality, and often poor design, that is certain to accelerate defeat of the Reich.

Because of the scarcity of good wood in Germany rifle stocks are now made of plywood instead of solid walnut. This substitution adds 1 lb. in the weight of the gun, and in addition dulls the turning tools when the gun is manufactured. The cement used in the plywood makes it impossible to turn more than a third of the number of stocks with each sharpening of the tools.

A German recoilless 75-mm. gun, designed for air-borne troops has definite limitations. The bottom of the cartridge case is made of plastic and blows to pieces when the shell is fired. It is a difficult weapon to make and has a very short range.

Many of the Japanese and Italian weapons can be traced back to original German designs. However, these designs are frequently outmoded so that even with modifications the weapons are inferior. The Italians seem to have no basic engineering policy in regard to their weapons. They have made a lot of different designs with no effort at standardization. After World War I they came into possession of a good deal of Austrian equipment; apparently they relied on this as some of their weapons showed that the original Austrian identification marks had been filed off and Italian markings substituted. Many of these weapons date back to the designs developed between 1900 and 1905. They have restricted fire power and some models have an elevation limited to plus and minus three degrees.

Japanese weapons also betray their vintage. For instance, their 75 and 150-mm. models are copies of German guns originally adopted by Japan in 1905. The best Japanese weapon in use today is the 105-mm. howitzer.

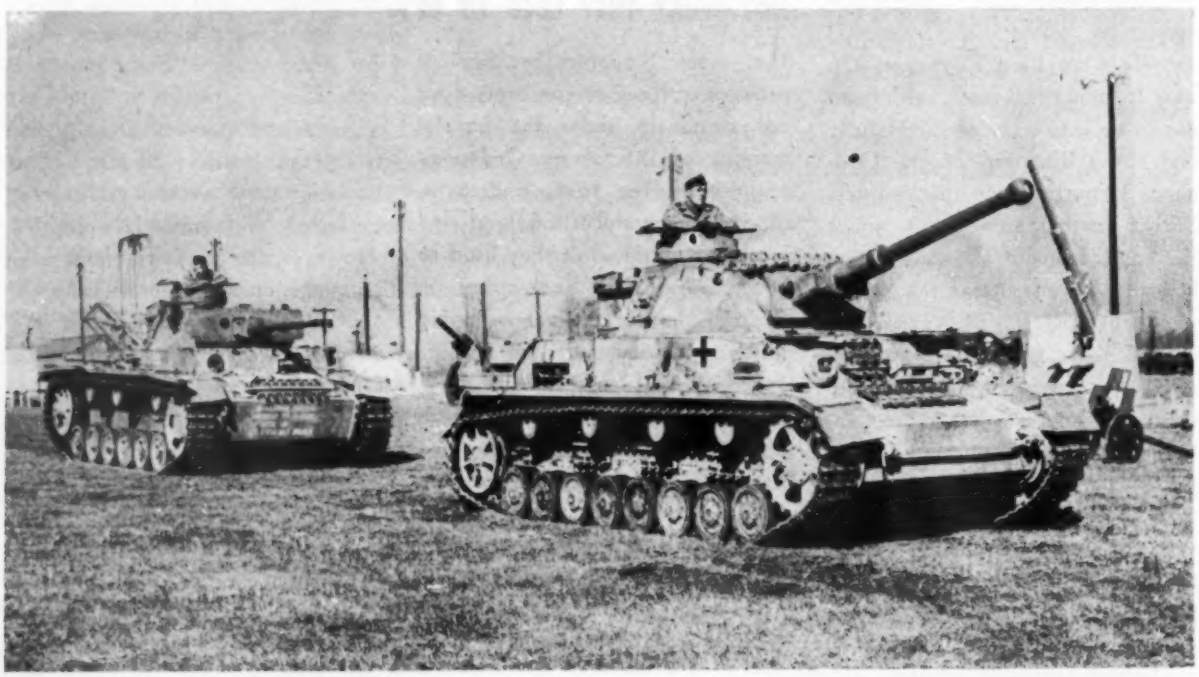
While German weapons are superior to both Italian and Japanese models, they often reflect the bankrupt resources of conquered countries. For instance, they have rebored the chamber of certain captured guns in such a way that the factor of safety is greatly reduced, and the weapon can be classified as unsafe. The Germans took over about 8,000 Czech tanks as well as most of the French tanks that could be used. This equipment has, for the most part, ceased to be used for its original purpose. The chassis are used as self-propelled mounts for guns because of the unfitness of the original design for modern tank warfare.

Enemy Uses Poor Armor Plate

All foreign enemy weapons show inferior armor plate. A Japanese tank captured at Kiska, built in 1942 had light armor that would dent under a hammer blow. The Italian armor has never been much better than boiler plate. The German plate has deteriorated until it is not a great deal better than that of their allies.

Occasionally German materiel shows signs of sabotage in their own manufacturing plants.

Artificial rubber used in German equipment will not stand high speeds or give long wear. Apparently Germany is running out of substitutes at the expense of her troops at the front.



German PzKw III and PzKw IV tanks are given a test run at Aberdeen

Corrected Diameters for Circular Form Tools—I

BY BASIL S. SAMPLE,
TOOL DESIGN DEPARTMENT, DELCO-REMY DIVISION, GENERAL MOTORS CORPORATION

CIRCULAR FORMING TOOLS have their cutting faces offset with relation to the center of the tool to provide sufficient peripheral clearance. Hence the cutting diameters of the tool do not have a direct relation to the diameters cut on the work. There is a faster method than the usual process of calculating the corrected diameters of the tool, the "square and square-root" method, using the formula:

$$r = \sqrt{(\sqrt{R^2 - C^2} - D)^2 + C^2}$$

where

r = corrected radius of a cutting edge (inches)
R = largest radius of tool
C = amount of offset of cutting edge
D = step on work (difference in radius between work cut by outside edge of tool and work cut by edge having radius r)

Assuming that for any particular tool the values of $\sqrt{R^2 - C^2}$ and of C^2 have been worked out as constants, the steps involved, after determining D, are as follows:

1. Subtraction $(\sqrt{R^2 - C^2} - D)$
2. Squaring (of quantity obtained in 1)
3. Addition (adding C^2 to amount obtained in 2)
4. Extracting square root (of amount given in 3)

If suitable tables of squares, such as Barlow's, are at hand, or if a calculating machine is available, this method will give good results.

A faster method, now in use in one designing room, has for its basis the use of trigonometric tables of cotangents and cosecants. The accompanying chart shows the procedure used. In practice, the information necessary is listed on tracing paper, and white-background prints are used for the actual calculation of each tool.

The method of calculation will be described for an actual case. Assume a tool outside diameter of 3.375 in., an offset of ¼ in., and a minimum work diameter of 0.426 in. Required: the tool diameter necessary to give a diameter of 0.817 in. on the work.

The step D is found by subtraction and halving to be 0.1955. This is divided by C, or ¼, obtaining 0.7820, which is subtracted from the constant 6.6755 (from the chart), giving 5.8935 for the value of cot B. This is looked up in a table of cotangents, and the corresponding cosecant is found to be 5.9778, which is multiplied by ½, or twice the value of C, giving 2.9889 as the corrected tool diameter. The "square and square-root" method gives a value of 2.98890 for this same figure.

The steps for the cotangent-cosecant method are thus seen to be:

1. Division by a simple fraction
2. Subtraction
3. Consulting trigonometric tables
4. Multiplication by a simple fraction

The processes of squaring and extracting a square root, which are time-consuming on a calculating machine, and almost prohibitively so by longhand calculation, are eliminated.

Five points are noteworthy.

1. Where the tool offset is a simple fraction, the calculation is easy. For example, to divide 0.1955 by ¼, multiply by 4 and obtain 0.7820. Also, to multiply 5.9778 by ½, divide by 2, obtaining 2.9889.

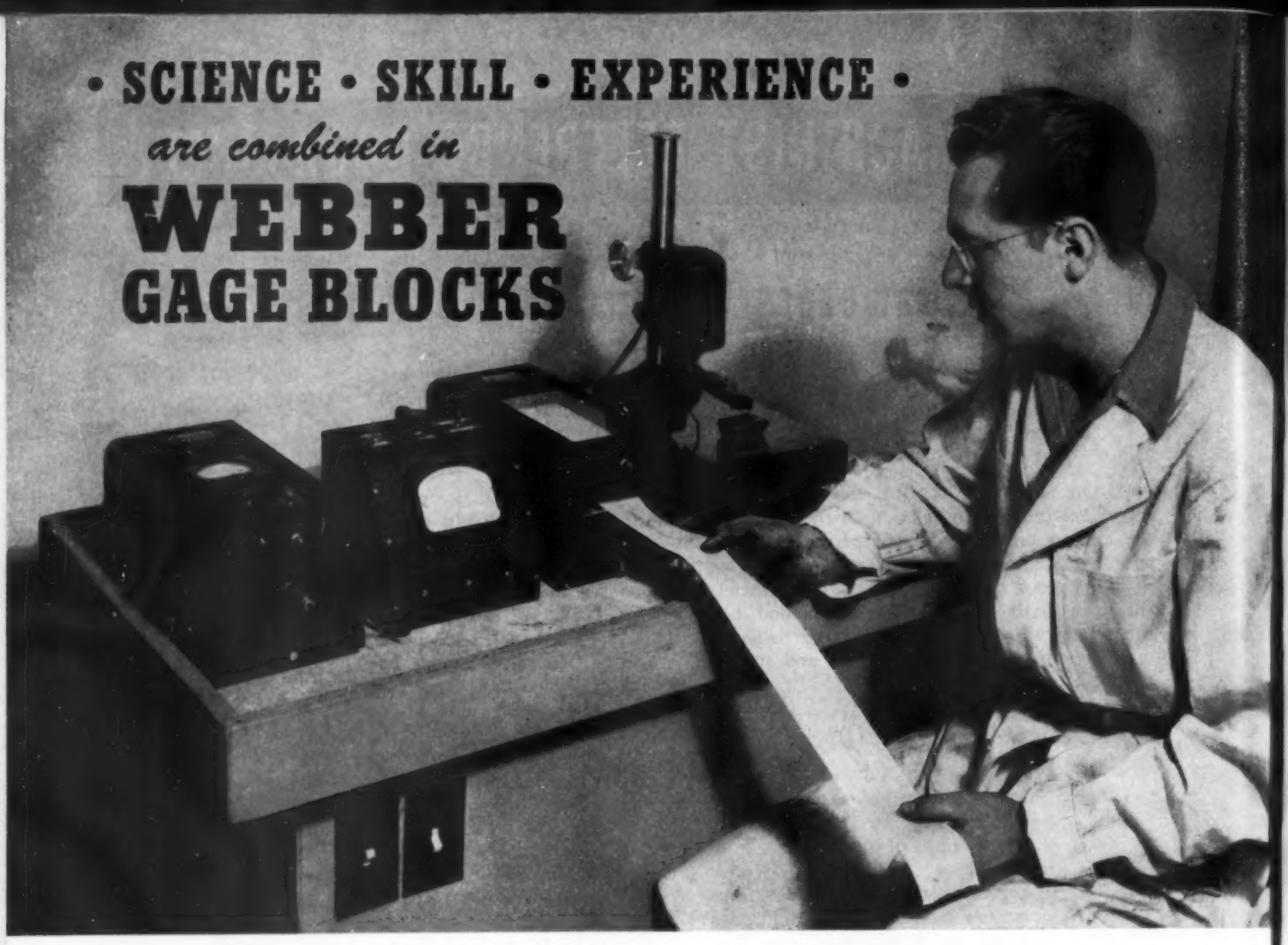
2. All constants in the table of cot A are based on the fractional value of the offset, to facilitate longhand calculation. If a calculating machine is used, the value of C should be carried to four decimal places in order to obtain 4-place accuracy in the answer. Although the values of cot A are given to five decimal places, only four places need be used in the calculations.

3. In the region used on the chart, the tabular difference between cotangents and cosecants is practically the same, so exact interpolation of the tables is not necessary.

4. The answer obtained by this method is accurate within ± 1 in the fourth decimal place, which is sufficient for most form tools.

5. Equipment necessary for use of this method are paper, pencil, trigonometric tables, and a chart showing the value of cot A for the tool under consideration. It will be found that this method is faster and less subject to error for general use, than the square and square-root method, whether the latter is worked longhand, by calculating machine, or by using tables of squares.

The method may be adapted to circular form tools having top rake, but in this case the corrected offset is usually a decimal fraction, requiring a calculating machine for rapid work. Thus, the advantages of the cotangent-cosecant method are not so pronounced.



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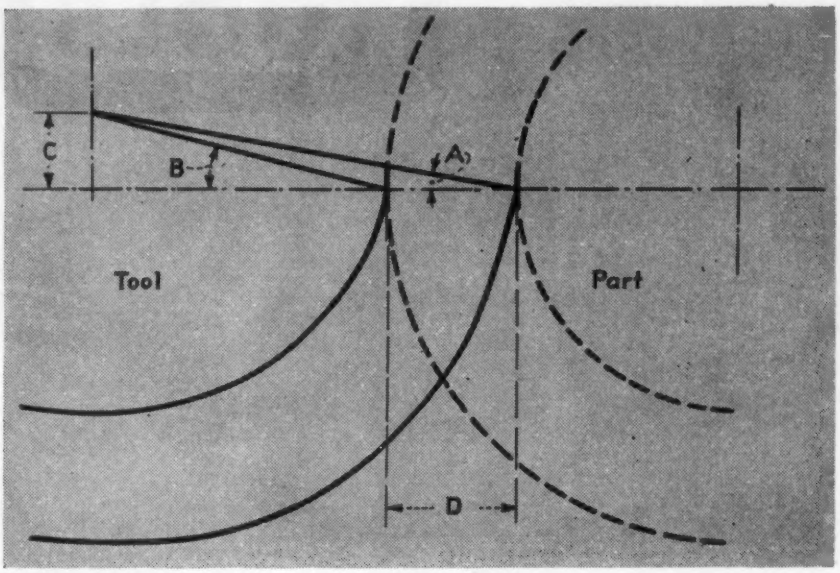
Corrected Diameters for Circular Form Tools—II

CALCULATIONS FOR CIRCULAR FORM TOOLS WITHOUT RAKE

Off-Set "C"	Tool O.D.	Cot A.
3/32	1.250	19.97498
1/16	1.688	13.46692
1/16	2.312	18.46895
1/16	2.375	18.97367
1/16	2.750	21.97726
3/32	1.125	5.91608
3/32	1.250	6.59124
3/32	1.375	7.26483
3/32	1.500	7.93725
3/32	1.750	9.27961
1/8	1.500	5.91608
1/8	1.750	6.92820
1/8	1.875	7.43303
1/8	2.000	7.93725
1/8	2.312	9.19378
1/8	2.375	9.44722
1/8	2.500	9.94988
1/8	2.750	10.95445
1/8	3.250	12.96148
5/32	1.938	6.12044
5/32	2.250	7.13022
5/32	2.312	7.33051
5/32	2.500	7.93725
5/32	2.688	8.54327
5/32	3.500	11.15527
5/32	3.750	11.95826
3/16	2.000	5.23875
3/16	2.250	5.91608
3/16	2.500	6.59124
3/16	2.625	6.92820
3/16	2.750	7.26483
3/16	3.000	7.93725
1/4	2.840	5.59128
1/4	3.000	5.91608
1/4	3.375	6.67552
1/4	3.875	7.68521
1/4	4.375	8.69267
1/4	5.000	9.94988
1/4	5.250	10.45227
5/16	4.000	6.32139
1/8	3.000	11.95826
1/16	3.000	23.97916



PROOF FORMULAE

$$\text{Cot B} = \text{Cot A} - \frac{D}{C}$$

$$\text{Corrected Dia.} = \text{Cosec B} \times (2 \times C)$$

FOR TOOLS NOT LISTED

$$\text{Cosec A} = \frac{\text{Tool O.D.}}{2 \times C}$$

Obtain Cot A from Trig. Tables

CONSTANTS FOR TOOL

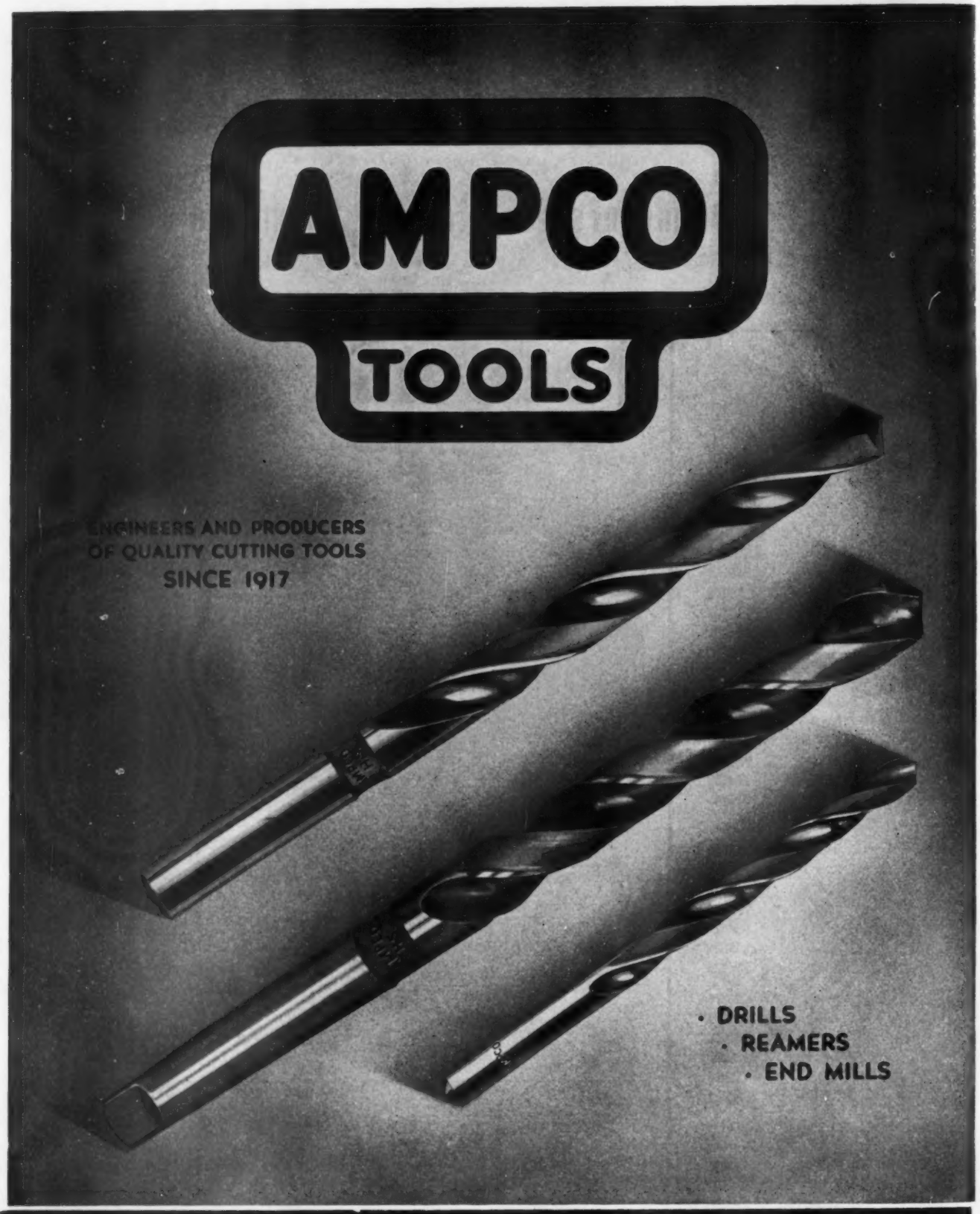
C = 1/4

Cot A = 6.6755

(2 x C) = 1/2

TOOL 1/4 x 3.375

Part Dia.	Step "D"	÷C $\frac{D}{C}$	Cot A − $\frac{D}{C}$ = Cot B	From Trig. Tables Cosec B	x(4xC) Corr. Dia.
0.426 Minimum					
0.817	0.1955	0.7820	5.8935	5.9778	2.9889
0.982	0.253	1.0120	5.6635	5.7512	2.8756
1.000	0.287	1.1480	5.5275	5.6171	2.8085
1.250	0.412	1.6480	5.0275	5.1260	2.5630



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Toward a Beginning

DISPOSITION of government-owned machine tools is one of the worrisome after-the-war problems.

The sooner a start is made toward solving it, the quicker a solution will be found.

As yet no plan has been devised and accepted that will provide a solution. But there is no need to wait for unanimous agreement before beginning action.

Let each war contractor possessing an option to purchase the government-owned machines in his plant exercise that option immediately instead of waiting until reconversion is on top of us.

The machines bought obviously cannot be transferred to their new owners until the war job is completed, but the matter of finding out where we are with regard to surplus machine tools would be simplified and clarified.

Without further delay manufacturers then could decide what machine tools they will keep and what they will let go.

They can begin to figure, with some degree of intelligence, how to fit this equipment into their future manufacturing set-up and what new machinery they must buy to get back into peacetime production.

The government at the same time will have a true measure of how many machines it will have left for final disposition. Speculation will be replaced by accurate facts.

President K. T. Keller of Chrysler Corporation has proposed this plan that substitutes action for talk. Others have indorsed it. We believe it sound.

It moves a vital and vexing problem off dead center and gets it rolling. It avoids confusion and delay at the end of war production that might hinder the clearing of plants for peacetime operation.

Before the plan can be made to work, however, two preliminary steps are necessary. First, the Army and Navy must decide what plants and machine tools they wish to retain as stand-by facilities after the war for the sake of our national security.

That will clear the way for war contractors to know what they can buy and what they cannot.

Second, a fair price formula must be worked out so that contractors will be able to figure out what the machines will cost them. The price must be high enough so that the government will be adequately paid for its property and must be low enough to encourage contractors to exercise their options wherever the machines will fit into their needs.

Manufacturers can easily make up their minds what they want if they know what price they must pay and if they know whether the machines will be available at the time when they must have them.

Only in this way can we make a start toward a solution of the surplus machinery problem. It isn't necessary or advisable to mark time until the war with Germany ends and we are suddenly plunged into a major reconversion period.

Now is the time for action.

Burnham Finney

Gaging Business

Emphasis in war production is shifting rapidly from defensive to offensive weapons, thus bringing about important readjustments in war industries. Planes, ships, heavy-duty trucks, heavy construction machinery, landing mats and landing barges will form major part of the 1944 program. By contrast, small arms ammunition schedules will be cut 56% from 1943, and anti-aircraft artillery 50%. The 36% cutback in tanks is due to the advanced stage of anti-tank weapons.

Construction machinery, landing barge, and truck programs are competing for critical components, such as valves, bearings and engines. Top priority for landing barges has hit Army truck scheduling hard, especially in bearings and flat-rolled steel.

At mid-December, airplane output at 3,800 was 6% ahead of the mid-November total. December's total output may be around 9,350 planes, of which at least 1,100 will be heavy bombers. Most plane types are on or ahead of schedule.

Steel outlook is so optimistic the plate situation is expected to ease in 45 days. This would automatically shift some mills to sheet production, thus breaking that bottleneck. Such expectations lie behind WPB's Steel Division's efforts to lift M-126, restricting the use of steel in hundreds of civilian items. The CIO Steel Workers support such action.

Some government spokesmen lean to the belief that machine tool output in 1944 may approach $450,000,000, as against earlier estimates of $325,000,000. Two reasons are given for improved prospects: (1) potential orders from civilian goods manufacturers, such as the automobile industry; and (2) possible exports to foreign nations to aid reconversion to civilian production. Moreover, backlog has not fallen as swiftly as many expected. Thus, the industry enters 1944 with a $200,000,000 backlog.

Machine tool orders tentatively placed by the automobile industry may be okayed early this year by Washington. Most top WPB men favor the step, including C.E.Wilson. Auto industry spokesmen contend this action is urgent, even if the industry does not produce a single car this year. But they admit that if the German war ends by mid-1944, some passenger cars will be made in 1944.

British machine tool manufacturers are reported to have completed post-war plans for foreign markets, including plans to enter the American market in a big way. British tool builders have the advantage of their government's support in international trade, and industry-wide cooperation in export trade.

Although Federal agencies have only admitted to $8,000,000,000 in contract cancellations and cut-backs, the actual amount is believed to be several times that. While actual figures may be withheld for fear that the public will read into them an early end to the war, their disclosure would reveal the urgent need for legislation on contract cancellation claims.

Industry-wide bargaining, one of the demands of the CIO Steel Workers, is regarded as a more important issue to them than the 17-cents-an-hour increase also asked for. Steel executives are divided on whether or not to grant this request. If allowed, the arrangement would subject many industry policies to union approval, and give the Steel Workers increased stature among the nation's labor groups.

Murray Bill Would Set Up Machine Tool Disposal Plan

Act proposes a 3-year postwar program based on classification of tools, stocking of federal agencies, encouragement of small metal-working shops and schools, and foreign sales

WASHINGTON — "After reserving a sufficient supply of tools [particularly special machines suitable only for munitions-making] for all government needs, current and future, the remainder under appropriate terms and conditions [would] be allocated for the maintenance and establishment of small metal-working concerns generally and in particular to aid in setting up war veterans in metal-working enterprises," explains Senator James E. Murray, speaking of his recently introduced "Surplus Machine Tool Utilization Act."

Designated as Senate Bill No. 1609, the proposal would establish a nine-man policy-making federal machine tool commission which, says the Senator, is "in no sense a new bureau. It is to be composed of representatives of the War and Navy Departments, the Maritime Commission and the Defense Plant Corporation, besides five additional members representing the industries concerned and the public-at-large. Existing government personnel and facilities are to be used to the utmost extent feasible, and the employment of additional personnel avoided wherever possible."

Establish Classifications

Tools would be classified either as "A"—those idle for one year after their manufacture, or "B"—those in use more than 7,200 hours, or "C"—those not falling into either of the preceding categories.

After satisfaction of government needs, general purpose class A and B machines would be offered to small metal working concerns having less than 100 machine tools, with preference being given to war veterans owning, or having a main interest in such concerns. It has been proposed that this equipment be assigned to small machine shops on the Lend-Lease principle of replacement in kind by which they will receive a new machine and give in exchange therefor one that has been in their possession for not less than three years; machines traded in this manner would then be handled in group C. Credit at less than three percent interest would be extended to such small concerns and other generous terms arranged. In case of war again within ten years, the government could take back all tools not being used for war production.

The remaining tools would be made available, free, for technical training in public schools.

The balance would be offered for sale, lending, exchange, or lease to friendly nations, subject to State Department approval.

Scrap Surplus in Three Years

The authority of the policy-making commission would end three years after the war, and within 60 days thereafter a final report of all transactions must be submitted. The bill would require that during the 60-day interval all machines remaining on hand be broken up and sold as scrap.

Persons supporting the bill claim that its enactment would provide employment for skilled tradesmen, engineers, etc., by reemployment of former employees demobilized from the military service, and to retain and extend these skills for the civil economic and technological development required to support the heavy taxes. They believe that absorption of surplus government-owned machined tools through this procedure would insure employment in the industry, utilize the surplus tools for increased efficiency so that industry can meet the tax load, provide means for training young men for the mechanical industries and utilize the surplus tools to establish a market for products of the United States in specified foreign countries.

OPPOSE RENEGOTIATION RIDER

WASHINGTON — Secretary Morgenthau's attack on the renegotiation rider to the 1943 Revenue Act was held to presage Roosevelt's veto of the measure if it is passed by Congress substantially unchanged. Morgenthau said that the proposed renegotiation measure held "the seed of a national scandal." However, opposition to the bill's provision for court review of renegotiated contracts had earlier been expressed by the representatives of the Army, Navy, Maritime Commission, and other federal departments, who feared that it might result in considerable litigation.

Senator George rebuffed Morgenthau's criticism by saying that Morgenthau knew nothing about renegotiation and less about how it is administered. George revealed that James F. Byrnes' Office of War Mobilization was under consideration as the "central" authority over postwar reconversion problems. Stating that most of the Senate's Postwar Committee shared his views, George added that if one executive headed reconversion, he should be aided by an advisory board including representatives of industry, agriculture, finance and labor.

Easing of Steel In 45 Days Marks Renewed Drive To Lift M-126 Curb

WASHINGTON—WPB officials report that the steel situation will have entirely eased by next February, by which time the bottleneck in plate and sheet will have been broken. Despite statements to the contrary by the Maritime Commission, opinion leans to the probability that shipyards will require about one-seventh less tonnage of plates as a result of the January 1, 1944 cutback of yard operations from 7-day to a 6-day week.

Would Ease Sheet Production

Any resulting reduction in plate requirements and production would permit shifting rolling mills over to sheet production, thus easing that situation, also. This should stimulate greater activity by government officials in allowing resumed production of various types of consumers goods items. It is true that unavailability of motors will prevent early 1944 resumption of production of washing machines and refrigerators, but most other types of civilian types of goods requiring flat-rolled steel probably could be made.

A major step in this direction would be the removal of regulation M-126, which restricts the use of steel in many civilian-type items, such as kitchenware, stoves, and water pumps, all the way to such small items as napkin rings. The Steel Division favors the removal of this order, but higher WPB policy-making officials have opposed the step as too risky.

This attitude will be blamed if steel activity drops to 90 percent during the 1944 first quarter as is now predicted. It is pointed out that removal of M-126 would create a reserve demand for such surplus steel as could not be used for war purposes, thereby making unnecessary the enforced idleness of steel furnaces. Support of the CIO Steel Workers Union may result in WPB action to head off a drop in steel operations.

Pittsburgh Industrialists Foresee Easy Reconversion

PITTSBURGH—Business men of this area believe they will be able to reconvert to peacetime production more quickly and more easily than possibly any other industrial area of the nation. They believe reconversion will be largely a job of finding new markets for vastly expanded old-line facilities—or of curtailing capacity with a consequent employment drop.

Unlike mushrooming armament centers, Pittsburgh will have few plants that must be closed, few machine tools to be thrown out, few industries that will have to start from scratch in new fields. About 75 percent of new productive capacity brought to the area by the war is viewed as vital to a peacetime economy; the remaining expanded facilities will have a limited peacetime use or can be converted.

Disposal Plan Studied

DETROIT—Tool company executives, long worried about disposition of postwar surplus cutting tools, met here recently to discuss a marketing plan which has been under favorable discussion in Washington. The plan has been set up to bring reasonable recovery to the government on its investment, and to make possible the maintenance of production in tool shops.

The chief points of the plan, as outlined at the meeting, are: All leftover perishable tools would be assembled in a central warehouse for sorting; Special tools, useless outside their particular operation, would probably be scrapped; Standard tools would be returned on consignment to their manufacturers, billed at probably 60 percent of the original cost to the government; The manufacturers would be expected to draw on this pool for a fourth of all orders received for those particular items. At the end of each year, settlement would be made with the government for consigned shipment which was sold.

Landing Barge Precedence Scuttles Truck Program

DETROIT—The truck program is the number one victim of the directive giving the landing craft items the top spot on the production list. Seven of the automotive plants have a big part in the landing craft program. Not only will the vitally needed civilian trucks feel the blow of the changing strategy, but the military trucks will also suffer. The huge demand for power plants will impede the 1944 plans to build more and more of larger and larger vehicles which would follow the invasion armies.

So vitally is the truck program hit, that there is little likelihood that any civilian trucks will be built in the first six months of the year. Last-half schedules will probably be disrupted as well, so that the 123,000 goal which has been okayed and happily awaited by the transport industry, will never be achieved.

The truckers have seen this happen before. Of the 7,000 scheduled for the final quarter of 1943, only about 100 were built.

Implement Plans Laid

CHICAGO — Agricultural machine makers in this area are talking postwar production of cotton pickers, sugar beet harvesters, hay-baling equipment and self-propelled combines.

Officials of the larger firms are warning against too radical changes in existing equipment. The same high-wheeled machines that were popular with farmers in the past, improved for ease of operation and economy, will be the principal postwar product.

Deere and Company has announced intention to make cotton pickers under the Berry patent, and that some of the new spindle-type pickers will be on the market for the 1944 season. International Harvester is known to have considerably improved its 1937-introduced mechanical picker. Local metal trades circles expect Harvester, and possibly some others, to announce cotton pickers soon.

The war-created backlog of agricultural implement demand is estimated at about $2,000,000,000, equal to about three years' output.

ENGINES WITH MORE UMPH

NEW YORK—Army Air Forces will provide its pilots with engines having more power per cylinder as fast as necessary modifications in design can be made. One plant, for example, is stepping up the installation of machines for manufacturing the forged cylinder head, said to produce an appreciable gain in power, perhaps ten percent.

Another plant, on the other hand, was told to stop plans to make a forged head. Obviously, the seemingly contrary instructions are based upon the characteristics of the engines made in the respective plants. Evidently one plant is making a model that has been "beefed" up so that it will stand the additional stresses, imposed when the pilot takes advantage of the extra margin of power available with the forged head. The other plant is producing an engine just as urgently needed in some other field of service, and for the present the pilot must get along with the peak performance for which the engine was designed. If the forged heads were to be applied to this model of engine, no pilot could be restrained from calling upon the extra "umph" available, and upon return to base his motor might well be ready for the scrap heap.

Cutting Tool Manufacturers Form a National Association

DETROIT—Formation of a national association of cutting tool manufacturers was voted, here, recently, by 150 representatives of some 100 manufacturers, who registered as "temporary members," pending the formation of the association proper.

To expedite the formation, the meeting elected a temporary board of nine directors, with W. G. Robbins, Carboloy Co., as chairman. Other members are: Oscar L. Bard, Michigan Tool Co., H. R. Connor, Detroit Broach Co., George W. Frick, Firthite Tool Div., Firth-Sterling Steel Co., E. A. Goddard, Goddard and Goddard Co., Norman Lawton, Star Cutter Co., R. G. Micheli, Eclipse Counterbore Co., R. M. Severance, Severance Industries, Inc., and R. H. Wolfe, Arrow Tool and Reamer Co.

Objectives Outlined

Among the objectives of the new association, discussed at the meeting, are assistance to the cutting tool industry and to federal and local agencies on such subjects as renegotiation, taxes, contract cancellation and termination, disposal of surplus cutting tools by the armed services, standardization of cutting tools to permit greater simplification of production equipment and methods, problems arising from cancellation of pool orders and postwar disposal of emergency manufacturing facilities.

To Shun Pricing, Marketing

With the exception of cooperative assistance to the armed services in simplifying disposal of surplus war equipment, it was decided that the association should have nothing to do with prices or marketing of tools.

With regard to contract cancellation, it was pointed out that tool manufacturers usually are sub-sub-sub-contractors and frequently have to hold up production for months, without being able to obtain financial settlement on the completed part.

The meeting was arranged by an organizing committee including E. C. Putnam, Putnam Tool Co., W. G. Robbins, Carboloy Co., Emil Gairing, Gairing Tool Co., and George Sheldrick, Midwest Tool Co.

Inside Detroit

Results of American Machinist survey of auto industry machine tool requirements are announced. Car makers see big postwar sales and will rush to tool up accordingly. Great amount of modernization expected. Space at premium

Tool Prospects Surveyed

The automobile industry will be in the market for a lot of machine tools and of other production equipment in the next few years. Purchases are likely to be at least $250,000,000 and may go up to $300,000,000 or higher. Those figures are not based on wild guesses, but are the result of a careful survey just completed by AMERICAN MACHINIST.

Though motor car makers are still immersed in their war jobs, they are doing some figuring ahead on what they will need when they again can build automobiles. The new purchases will be stimulated more by the desire to secure additional manufacturing capacity than by the necessities of reconversion itself.

Foresee Rich Car Market

All companies are convinced that a lush retail market awaits them when they can return to their normal job of making motor cars. They are thinking in terms of a six-million-car year. In order to manufacture cars on such a grand scale, they must install more automobile-making equipment. Hence, most companies are counting upon expansion of at least 25 percent in productive capacity and in some cases the figure is as high as 50 percent.

One firm, for example, will spend a minimum of $3,500,000 to duplicate machines already in its machining lines that are now dismantled and that again will be used when car making is resumed. Another company, an independent, is planning on grabbing enough of the passenger car market to call for production at five times its previous rate. At least two body stamping plants are to be newly equipped with presses and other machinery by a leading company.

Expect Quick Capital Return

Modernization and cost reduction enter into plans for buying new machine tools and other plant equipment. One company alone expects to buy hundreds of single-purpose machine tools in the next two or three years. These machines will be so productive of savings that their cost can be written off in a year or less. They will more than pay for themselves in that time.

A prominent automobile company is now formulating an extensive modernization program that will bring big business to machine tool and allied lines. It has recently completed a survey of the age of its equipment that confirms its belief that replacement of a large amount of older machinery will be money well spent.

Buy Little For Reconversion

The physical reconversion of automobile factories will not require huge quantities of new machine tools. It is estimated that 85 to 90 percent of the machine tools needed to get started again will be available. Much of this will be reconverted from war work or has been set aside and not used in the war effort. One cannot discount, however, the tremendous importance of the replacement of the missing 10 to 15 percent of machine tools. Without them it will be impossible to get going again.

General Motors alone has over 3,000 machine tools missing that it must replace if it is to resume automobile manufacture. The quicker that it can place orders for these machines and have them built, the earlier it will be ready to swing into car production after the word is given by Washington permitting resumption. That is why General Motors feels it would be extremely helpful to a shortening of the unemployment period as war production wanes if Washington would allow machine tool builders to fill orders soon for new machines vital to car manufacture. Such orders have been placed tentatively, but cannot be acted upon by machine tool companies until WPB gives the green light.

Would Buy Some Government Tools

If government-owned machine tools are to be available at the right price and at the time when car makers will want them, the number that will be bought will be 10 percent at a minimum and 20 percent at a maximum. Much of the government machinery in automotive plants is highly special and not adaptable to automobile making. Chrysler, for instance, has 19,277 government-owned machines in its plants. President K. T. Keller has said that the company would like to buy 3,000 to 4,000 of these machines.

General Motors has 56,708 government-owned machine tools in its plants and probably will purchase not over 15 percent of them and perhaps even

Brass Ring for Axis Nose—Several merry-go-round gaging and weighing machines in the St. Louis Ordnance plant automatically inspect six dimensions of a cartridge, weigh and count the good ones, in one second each

less. It is doubtful whether Ford will want to acquire more than a small percentage of the DPC machines in its plants.

First Cars in Three Months First cars will come off the lines within three months after the "go ahead" signal is given. But quantity manufacture won't be achieved for six months or longer. Some companies may be seriously delayed by war commitments and may be compelled to improvise ways of making parts and assembling cars on a temporary basis.

Nash-Kelvinator, for example, is tied up on aviation work that is likely to continue beyond the end of the war with Germany. Packard is in an even tighter fix. It has been told that it will have to continue making Rolls-Royce Merlin engines on a big scale up to the defeat of Japan. All of its plant facilities are fully occupied.

Space Is The Problem Nineteen forty-two dies are intact and have been carefully guarded. Jigs and fixtures and other tooling will be necessary, but the main task will be to get the automobile plants cleared of war-making equipment—machinery, parts in process and raw materials. What automobile companies will need most is manufacturing space. If they can get that, the time for getting back into production won't be long.

Experts See $450,000,000 Tool Shipments in 1944

WASHINGTON—Government spokesmen now believe that 1944 machine tool business may total $450,000,000, instead of previous estimates of $325,000,000. The new forecast is largely based upon the probability that at least $75,000,000 in orders may be placed to reconvert various industries to normal production. Bulk of business would come from the automobile industry, with some possible orders from refrigerator and washing-machine makers. Hinging upon WPB's okay, most of the auto industry's orders would be for special type tools, such as gear-cutters, way drills, presses, and so on. Most auto industry standard tools can be reconverted back to auto work.

Moreover, orders may be placed to help industrialize Allied Nations now passing their munitions output peaks. Many of them can pay cash for such machines, and need them to support civilian economies after cutbacks in arms production. Such orders may not now be shipped abroad due to lack of priorities. Considerable inquiries have poured in to export representative offices and Purchasing Commission agencies, and firm orders are waiting. However, diplomatic pressure may change WPB's attitude on priorities.

Contract Cancellation Proposal Holds Means to Speed Settling

WASHINGTON—On December 21, the Senate subcommittee studying contract termination legislation outlined to Congress a proposed bill to speed settlement of contract cancellation claims, assuring contractors of 75% cash payment against their claims within 30 days and the ability to remove from plants government property in process within a similar time limit.

The Bill would set up an Office of Contract Settlement, headed by a Director, who would be chairman of an advisory committee including representatives of the General Accounting Office, the contracting agencies, WPB, War Manpower Commission, Department of Justice, Department of Labor, and the Smaller War Plants Corp.

Personal Liability Out

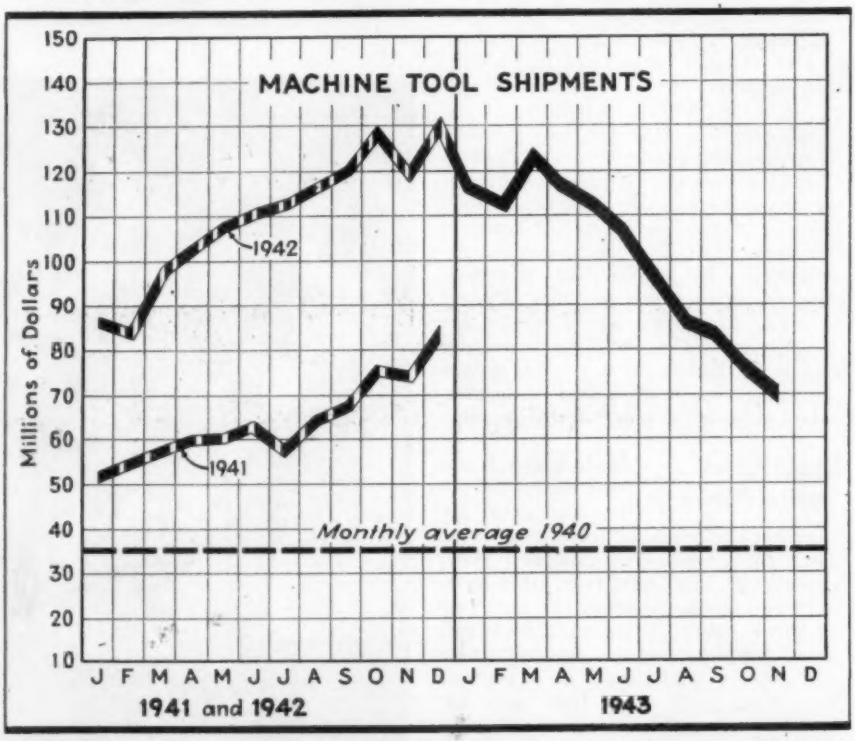
While the existing authority of the contracting agencies to make final settlement would be unchanged, contracting officers would no longer be held personally liable, except in cases of fraud. The General Accounting Office would have available to it all records, must report fraud cases, but cannot hold up termination payments.

Prime contractors would be encouraged to settle directly with subcontractors, but where this was not feasible, contracting agencies with the consent of prime contractors, could deal directly with subs, or buy outright the subs' claims. Within 30 days after cancellation claim has been made, contractors would receive mandatory payments of at least 75 percent up to 100 percent of the claim. Advances may be made through loans guaranteed by the contracting agency, or direct loans from the agency.

May Remove Materials

Work-in-process must have at least 15 days advance notice, and may be completed wherever it would save the government money. Instructions for delivery to the government of materials on hand are to be given within 30 days, or else the contractor may remove and store them. Prices received for materials sold under federal direction would constitute full settlement by the war contractor for such materials.

The Smaller War Plants Corp. is given power under the proposed bill to do whatever possible to aid small business by purchasing cancellation claims, making loans to assist reconversion, purchasing or selling plants, equipment and materials released by cancellations, and giving advice.



Tool Shipments Down 8.6 Percent—November tool shipments dropped to $71,543,000 from October's $78,300,000. New orders were up 8 percent, but after cancellation of $5,979,000, the industry's backlog dropped to $245,571,000

Wartime Washington

The President continues to lose influence with the unions, as they sense his namby-pamby farm price policies, drive in for another slice, push for industry-wide bargaining. Agencies seek to learn post-war status, get little satisfaction on this score

Roosevelt Loses Face

The Administration's vacillating policies on farm prices have brought it the predicted results: a concerted drive by organized labor to secure wage increases commensurate with higher living costs. With this have also come further signs of Roosevelt's weakening standing with the unions. His rebuff by the coal miners has been followed by the railroad unions ignoring his attempted compromise, thus forcing federal seizure. Since the rails had already granted the 8-cents-an-hour wage increase which was then blocked by Economic Stabilization Director Vinson, the issue squarely became a government-vs.-labor fight.

But the short steel strike over wages further upsets and confuses Administration policies. The CIO Steel Workers want a 17-cents-an-hour wage increase and industry-wide collective bargaining, while the steel industry contends that it cannot increase wages without increasing steel prices. The industry's attitude is bolstered by the expected drop of at least 10 percent in steel activity during the 1944 first half with a probable sharper decline if the European War ends by mid-1944. Lower steel activity is held inevitable even if the government moves more swiftly in aiding industry to reconvert, since reconversion bottlenecks will slow up the transition.

CIO Asks For More

Perhaps the CIO's demand for industry-wide bargaining power holds even broader ramifications. Such a basis for labor-management negotiations presupposes a voice for labor in pricing policies and other broad operation problems generally conceded to be management's responsibility. Whether or not it will then spread rapidly to other industries, the CIO Steel Workers would stand to get maybe 100,000 more members from plants with independent unions and companies still without maintenance-of-membership in their labor agreements.

Top steel executives are divided on industry-wide bargaining, with some opinion holding to the belief that it would provide a united management front which would benefit the industry by preventing weaker managements from making swift concessions to unions thus literally forcing other companies to do likewise, as has often happened in the past. Others feel that this would greatly strengthen the CIO Steel Workers with the probability of a "one-way" labor-management arrangement with labor getting more and more advantages but not granting a single concession. With the nation now facing a general retreat from the high wages and living standards of the war, this development now is held to threaten labor-management strife.

Farmer Gets Most Benefit

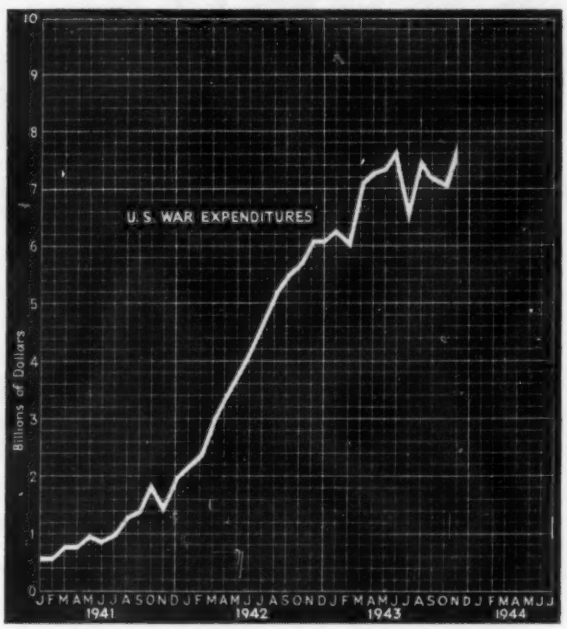
But while labor haggles to get enough additional pay to offset increased living costs, the farmer continues getting more and more for his products. Even food subsidies would only change the method of paying more to the farmers. Thus, the subtle undercurrent of the wage-price spiral of the past few years has been that the farmer has been getting all the benefit, labor has only been getting enough to pay more to the farmer, management has had to accept lower profits to meet this political program of the administration, and the war effort has cost the nation and the general public so much more. But Washington circles feel that labor is far from satisfied with spiraling food prices in the face of administration lip-service to "holding the line."

Besides facing this bearish labor picture, Roosevelt on his return from the Cairo and Teheran conferences was visited by almost every federal official interested in reconversion to get some commitment on just who was going to do what. It is suspected that Roosevelt may allow everyone to go along pretty much as they have been until they demonstrate some accomplishments on this problem.

War Agencies May Carry Over

Thus, most agencies charged with war mobilization may continue carrying on their same functions into the reconversion period. In fact, this has been suggested by Senator George, chairman of the Senate Postwar Committee. Obviously, the Army and Navy must have some say on which plants are relieved from war work and what happens to surplus items, while WPB will have to unravel its many regulations, restrictions, and limitations. Baruch probably will concentrate on the broad planning steps to expedite reconversion. And that general relationship may hold whether or not a special reconversion agency is set up.

An important step being recommended to those charged with reconversion is to free some of the surplus raw materials for experimental use by manufacturers trying to do some postwar planning. Under present regulations, manufacturers have no right to use any metals for experimental work, so that they have been forced to use scrap. Releasing small quantities of metal for experimental use is held to be a step long overdue.



A New High—War expenditures by the U. S. government in November hit the new high level of $7,794,000,000, recovering from the irregular slump of the preceding four months. Setbacks in war cost total were due to contract cancellations and renegotiations results, but total expenditures in November were large enough to offset these factors and reach a new high.

Dr. F. C. Frary Honored at Aluminum Research Anniversary

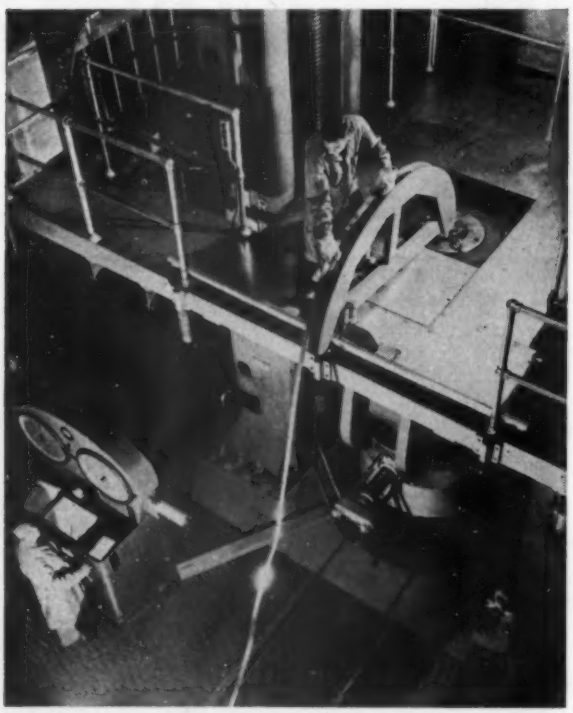
PITTSBURGH—December 16 marked a double milestone for the Aluminum Company of America. It was the 25th anniversary of the founding of the company's research laboratories and also the 25th year of service for the Director of Research, Dr. Francis C. Frary.

The occasion was duly celebrated by an open house at the laboratory, to which friends and employees of the company were invited, followed by a dinner at the University Club. Alcoa Vice-President S. K. Colby, acting as toastmaster, introduced the company's president, Roy A. Hunt, who in turn presented the 25th year award to Dr. Frary.

Tracing the development of aluminum from the discovery of the basic electrolytic process by Charles Martin Hall, Dr. Frary described the years of research which have made this metal so vital a factor in modern industry.

Dr. E. R. Weidlein, director, Mellon Institute, addressed the gathering telling how the results of scientific endeavor were helping to win the war and would later serve as a basis for peacetime industrial activity. A paper prepared by Dr. Webster N. Jones, director, College of Engineering, Carnegie Institute of Technology, was read because of his illness. It told of the universities' contributions to engineering research and warned against nationalizing these activities as proposed in the Kilgore Bill now pending before Congress.

Visitors to the laboratory had an opportunity to examine its excellent facilities. They saw radiographic and X-ray methods for detecting internal flaws; an electron microscope for the investigation of structural changes; a 3,000,000-lb. hydraulic machine for making extrusions and test forgings; and many other pieces of research equipment.



The largest piece of equipment in the Aluminum Research Laboratories is this precision-testing and metal-working machine which can exert a force of 3,000,000 lbs. at a speed of 36 in. per min. Forces within this range can be controlled and measured with an accuracy better than ½ percent. In the view, left, an aluminum strip is being extruded. The machine is also used for press forging experiments

Dr. Francis C. Frary celebrates his 25th year in aluminum research at his desk in the Alcoa laboratory

Postwar Foreign Markets Await Set Trade Policy

WASHINGTON—Establishment of a definite policy on foreign trade by the State Department is held to be the major obstacle facing American industry on postwar foreign markets, according to responsible government authorities. It is pointed out that lack of such a policy is now tieing up potential Russian business which may run into the billions.

The cancellation recently of some Russian tool orders under Lend-Lease is attributed to the discovery that some of these items were for use in postwar industrialization of Russia. However, this occurrence is held as proof that the Russians are right now in the market for new and used American machine tools and many other items. It is estimated that Russia might be able to absorb about $900,000,000 worth of new and used American machine tools to rehabilitate the areas destroyed by the Nazis.

The trouble is that Russia would like to offer its raw materials to us in exchange for the tools, and on this score such agreements may well impair U. S. relationships with certain other friendly nations. Barring this possibility, Russia would like to make its purchases under long-term credits, and here again such arrangements rest on American diplomacy.

Interested in Used Tools

While the whole question is up in the air, the Russians have restricted their activities to a healthy interest in available used equipment, even though they cannot now arrange for its purchase. If and when priorities are removed from the sale of used equipment, some heavy purchases for cash are likely on the part of the Russians.

Some observers fear that the British may corner most of the potential Russian business if the United States delays on this situation too long. Some of the blame for uncertainty over Russian trade is attributed to some American businessmen who have been rather wary of dealing with the Russians in view of the hard bargains usually driven by them. This and other factors have prevented the application of united efforts to secure action from the State Department.

However, it is emphasized that specific plans for industrialization of Brazil, Mexico, Chile, and Argentina, are also awaiting clarification of foreign trade policy by the State Department, as well as, being held up by lack of priorities to secure shipment of urgently needed machine tools and many other types of industrial equipment.

Spotting The Air News

Air authority sees big postwar use of personal planes, but many competent persons believe they will not be serious competitor for auto. Advanced fighter planes have new weapons. Lone Ranger production considered. Brewster query continues

A half million personal planes is the mark this country might achieve by 1950, is the opinion of Charles I. Stanton, Civil Aeronautics Administrator. Stanton sees the plane output to meet this demand as the key to postwar aviation. Our present total is about 25,000 light planes, which includes those ranging from one to five or six seats. If light plane sales are to meet his prediction, the Administrator admits they have got to be the right kind, and ground facilities will have to be good—meaning mostly convenient airports.

Many authorities will deny Stanton even this small hope for postwar demand for the air industry's products. The average citizen fears private airplanes because they must keep going at high speed until they are actually at rest on the ground; they can go to and from airports only, whence more travel is necessary to reach destination; they cannot replace automobiles and the citizen cannot afford both. Roadable planes and helicopters both seem to be several years in the future.

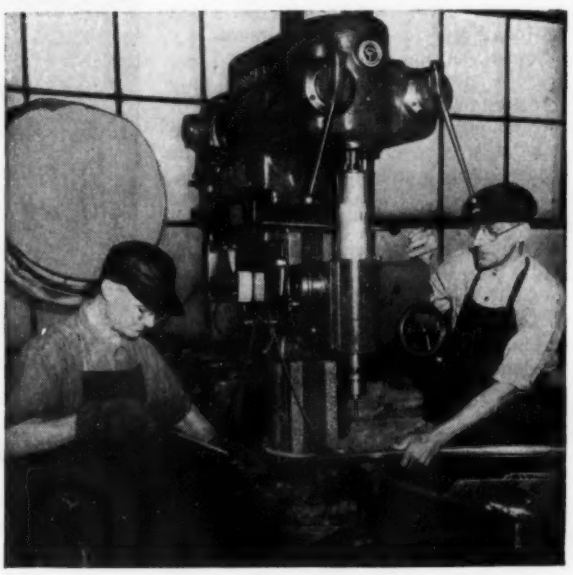
A long look into the future reveals perfected private flying machines in competition with the scheduled airlines—that is, people may fly their own rather than buy a ticket, just as they left the railroads in droves for autos. Indeed, the railroads, fighting pending legislation, are already accusing the airlines of seeking to suppress private aviation and to set up a monopoly for themselves. This is probably not true and if it were it would be short-sighted, because the promotion of air-mindedness by any means will add to the airlines' business.

Two new Army fighter planes, the P-61 and the P-63 will have new means of inflicting damage upon the enemy. Nothing can be told about these weapons until after the enemy has got possession of specimens. New features have been long in proof at Wright Field, Dayton, O., Air Force laboratory. Note that the enemy is desperately grasping at Buck Rogers devices while the United States and England so far have tried no major development that didn't work. None of the German radio-controlled glide bombs or rockets will pay off; this air war is being fought almost entirely with standard equipment under constant improvement, nearly all of it four or five and more years old. In advanced stages we have also, besides several fighters, two or three super-bombers, meaning they have more punch than the B-29's, which are not yet in combat.

"Lone Ranger" is the nickname of a two-engined long-range patrol bomber built by Boeing and tested and accepted by the Navy just a year ago —so-called because there was only one of them. Navy is seriously considering production of this plane, officially designated XPBB-1 (X means experimental, P is for patrol, B is for bomber, second B means Boeing, and the 1 means first model). It has enormous range—half way around the world at a point somewhat above the equator, and great lifting capacity. Boeing cannot build it because all company plants are occupied with B-17's and B-29's. Most unusual feature of the XPBB-1 is wing construction of angled sheet metal—no spars, no trussing. Cavities within these sheet-metal wings are used as fuel tanks. At this writing it was said that Navy was planning to put the Boeing PB in the Baltimore plant of Glenn Martin, which is curtailing production of its medium bomber B-26 (Marauder). The shift in plane design for the attack on Japan will feature long range. So far as can be learned, the Allies are not yet in possession of any ground from which Japan can be bombed, even with the B-29, fully loaded.

The Brewster story never ends, may not yet for some time. A House Naval Affairs Subcommittee, revealing almost unbelievable failure of Brewster to produce dive bombers and Corsair shipboard fighters, threatens to recommend cancellation of the Navy contracts. Taking an unprecedented stand, the Committee announced it would maintain surveillance over the company until it gets up to an acceptable rate of Corsair production—about 150 per month. Contracts for SB2A dive bombers have been cancelled because the planes were obsolete when Brewster delivered them in quantity. Aircraftmen were amazed to learn from the Committee report that Brewster delivered only 8 Corsairs up to the first of August, 1943, and the first one was ten months late. Most of the failure was blamed upon Thomas DeLorenzo, local union boss, but several Brewster presidents were charged with incompetent performance. The Committee itself, even after weeks of hearings on the subject, does not understand how a jinx could hold onto a manufactory so long and so effectively.

Notes for your book: Powerful officials are trying to stop Kaiser-Hughes work on three mammoth wooden flyingboats on the West Coast which probably will not get into the war. . . . Orville Wright will not bring his Kitty Hawk plane back from England till after the war; he is considering whether to give it to the Smithsonian Institution, which for two decades has discredited him in favor of Langley and that's a long story.



No Handicap — Despite the complete blindness of one and the partial blindness of the other, two employees at the plant of the American Welding & Mfg. Co. operate a drill press, working to dimensions within 0.005 in., and have a fine record comparable to that of normal employees. Using the same tools and gages as other operators, they turn out tank turret rings

Northern New Jersey Employers Combat Manpower Shortage

NEWARK, N. J.—Knowing that classification as an area of critical manpower shortage would mean the withdrawal or the withholding of war production contracts, leading industrialists in four northern New Jersey counties have banded together to encourage better use of available manpower.

The Community Manpower Mobilization Committee was formed, under the general chairmanship of William J. Orchard, general manager, Wallace and Tiernan Co., and the co-chairmanship of Earl R. Mellen, vice president, Weston Electrical Instrument Corp., and president, Newark Chamber of Commerce. The committee covers all of Essex county, the greater part of Hudson and Union counties and a small part of Bergen county. A chairman heads up the work of each of the first three counties.

William J. Orchard

Upon its organization in July, the committee announced as its purpose the increase of the area's output of war goods by: (1) Increasing the output and efficiency of workers now employed; (2) Keeping the level of employment in each plant at the lowest point consistent with efficiency; (3) Replacing male employees with women wherever possible; and (4) Recruiting new workers from residents of the area.

Recruitment of workers, under War Manpower Commission rules, must be confined to the area in which a plant is located and to the immediately adjoining areas, in order not to aggravate housing problems. The only solution to the manpower shortage of these northern New Jersey communities, then, is to make better use of the labor supply available.

Emphasize Production Need

An intensive program of publicity and education was instituted to awaken all employers and employees to the genuine need of increased production. Meetings and letters to plant management underscore the importance of their doing all within their power to increase output. Articles in company house organs, posters in plants and talks before employee groups bring home to workers the importance of their position in any scheme to increase output.

Subcommittees work with industrial organizations to ascertain if manpower is being fully utilized and to recommend steps to reduce hoarding to a minimum. This makes it possible for industries most critically in need of labor to have their most urgent needs filled by transfer of employees working in other war industries, in less essential industry, and in business.

Industries are encouraged to utilize women workers wherever possible, thereby relieving the demand for men and making it possible to transfer them to activities women could not handle.

To recruit additional workers, without importation from other areas, the Citizens Committee set out to persuade thousands of people, who under normal circumstances would not go to work in a war industry, to take a job there. This drive is aimed mostly at full-time employment of women, but related to the effort to encourage split shift usage of otherwise-employed men and women. Drives through clubs, churches and by radio, newspaper and billboards encourage men and women to apply for war work, either full time, or in the hours following the ending of their regular employment.

Ease of Work Shown

Extensive recruitment campaigns go on in each of the 46 municipalities in the area. Thirty-three war jobs headquarters were opened in the principal communities, in addition to the already established ten offices of the U. S Employment Service there. Demonstration equipment is set up in many of these offices, that uninitiated workers may see how easy it is to operate.

The committee has done much to encourage the establishment of child care centers, having found this in many instances the solution to the securing of additional women workers.

By and large, women ask for daytime jobs. But many plants offer them only night work, leaving veteran employees on the day shift and expanding work time into the night through the use of new labor. The committee has sought through conversations with plant managers, to arrange the placement of more women in the day shifts, and many plants have created part-time day shifts for them. Aversion to night work is based, not merely on a dislike of unescorted travel at late hours, but upon a desire to spend the evenings and nights with their families.

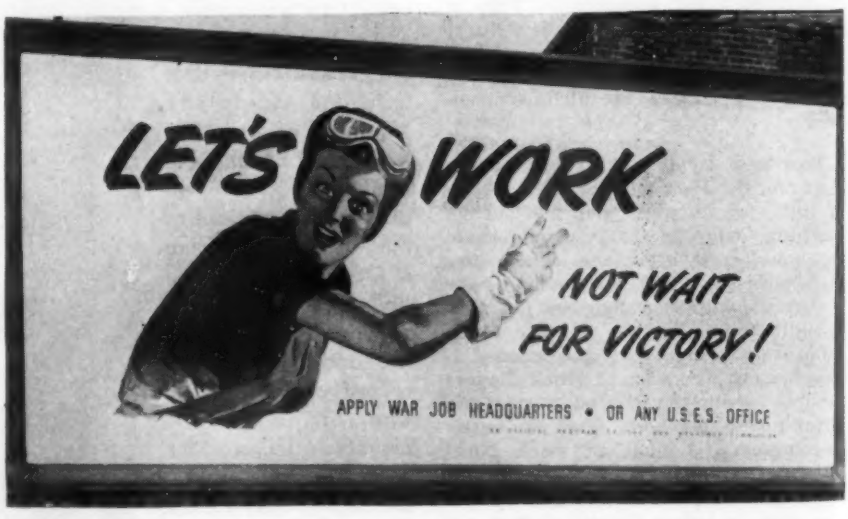
Many women have been kept from war work by the prejudices their husbands have against them accepting employment. An active publicity campaign is being carried on to show husbands how unjustified, how unpatriotic is their objection.

Use All Advertising Media

Every means possible is used to bring the drive for workers to the attention of the employers and workers. Stories and advertisements appear in local newspapers. Radio stations carry programs and half-minute announcements urging cooperation with the war production drive.

A series of newspaper advertisements, each keyed with the dynamic figure of a woman worker, carry various themes and illustrations built around the thesis that additional and faithful workers are necessary to the saving of the lives of our soldiers. One depicts a little girl in the arms of her soldier father, looking into the eyes of the reader and asking, "Won't you bring my Daddy back to me?"

A stark representation of a crude



Billboards and window cards carry a dynamic message to workers in the Northern New Jersey area where the Community Manpower Mobilization Committee seeks complete labor-power utilization

wooden cross raising a helmet against the sky, with the statement, "He didn't quit his war job . . . do I dare quit mine?" discourages workers quitting to take other jobs, urges upon women their duty to the war effort.

Pamphlet Distributed

The Newark Civilian Defense Council is cooperating in the door-to-door distribution of 150,000 copies of a flyer, "A Call to Women," outlining the great need for women workers and explaining how and where they may apply for employment.

Since many new workers have gone directly to war plants to apply for work as a result of the campaign, it is impossible to tell how many placements are due to the drive. However, it is estimated that in excess of 19,000 have resulted during the two-and-one-half month period, September 1 to November 1, 1943. Since the campaign started, turnover has been reduced considerably; one big concern with a nine percent turnover in July had but three percent in October.

Committee is Self-Supporting

The committee pays its own expenses; no funds come from governmental sources or from any organized civic group. The industries concerned have paid in large sums of money to carry on the work, but their interest is not a selfish one, for some have large backlogs of orders that wouldn't be affected by the withholding of future contracts.

It is believed that if more industries would open up for part time jobs, manpower troubles would be largely solved. Meanwhile, the committee is hammering every day to get more of these part time jobs provided and is meeting with a good deal of success.

NAMES in the NEWS

Wm. E. Curran

William E. Curran, formerly manager of the Richmond, Calif., plant of Rheem Mfg. Co., has been named vice president in charge of manufacturing and general manager of the company's eastern division. Mr. Curran will make his headquarters in the New York office and will have direct charge of manufacturing operations of the firm's fourteen plants in the United States. Prior to joining Rheem in 1942, Mr. Curran was general superintendent of the Birmingham plant of Republic Steel Co. for 18 years.

John A. Seubert, vice president of Pennsylvania Rubber Co., Jeannette, Pa., has become president of Eisemann Corp., Brooklyn, N. Y. The corporation was formed by the consolidation of Eisemann Magneto Corp. and Airward Corp. and manufactures magnetos, fuel injection systems, couplings and various electric assemblies for aviation, automotive, marine and industrial internal combustion engines.

T. R. Rideout, formerly associated with Nuttall Wks. of Westinghouse Electric & Mfg. Co., E. Pittsburgh, has joined Watson-Flagg Machine Co., Paterson, N. J., as project engineer on worm gear speed reducers and gear motors.

David Gross has been appointed sales director of the materials test division of Allen B. Du Mont Laboratories, Inc., Passaic, N. J. Mr. Gross has been identified with the firm for several years.

Frank E. Brown, for 15 years assistant sales manager of American Pulley Co., Philadelphia, has been named general sales manager to succeed Archie Chandler who has announced his retirement from active sales management of the firm. Mr. Chandler will continue as vice president, but will return to his former home in San Francisco, where he will direct sales and service on the West Coast.

O. O. Lewis, formerly branch manager of the Atlanta, Ga., office of Fairbanks, Morse & Co., Chicago, has become assistant general sales manager of the company. V. O. Harkness, previously manager of the Dallas branch, has been appointed manager of the diesel engine sales division, Chicago; while H. J. Renken, manager of the oil field division at Dallas has now been made branch house manager of the branch in that city. He continues as manager of the oil field division. J. S. Peterson, formerly scale department manager of the Cincinnati branch of Fairbanks, Morse, has been promoted to the office of branch manager. G. N. Van Epps, who was previously manager of the diesel department, Chicago, has been advanced to manager of the Atlanta branch.

Harry S. Rose, formerly chief engineer of Progressive Welder Co., Detroit, has been advanced to chief sales engineer. He is succeeded as chief engineer by Fred C. Handren, who has had varied experience as a consulting engineer, production and maintenance supervisor and as product engineer. He has been associated with American Forge & Socket Co. and AC Spark Plug Co. of Flint.

Stuart H. Betsinger has been advanced to sales manager of Kinney Aluminum Co., Los Angeles. He has been connected with Kinney for over a year as sales engineer, and was previously associated with Western Pressure Control Co. and Union Oil of Calif. in various engineering capacities.

Bruce Price, formerly connected with Landis Tool Co., Waynesboro, Pa., has become associated with Stedfast & Roulston, Inc., Boston, machine tool distributors. He will handle the sale of machine tools in Rhode Island, eastern Connecticut and southeastern Massachusetts.

J. Allan Machin has been appointed general sales manager of W. O. Barnes Co., Detroit. Mr. Machin was previously associated with Alexander Bros., Philadelphia, makers of leather belting and belt lubricants.

Sales Manager *Vice President*

J. A. Machin

F. W. Copp

Frank W. Copp has been named vice president of Lynd-Farquhar Co., Boston, machine tool distributors. Mr. Copp has been connected with the organization since 1930 as a field service engineer.

Leon R. Ludwig has become manager of the motor division of Westinghouse Electric & Mfg. Co., E. Pittsburgh. Formerly Mr. Ludwig was head of the company's circuit breaker and protective devices division.

Donald J. Luty has been named general manager of the heating division of Gar Wood Industries, Inc., Detroit. He has been with the company for 14 years and for many years was assistant general manager of the heating division.

William A. Blume, president of American Brakeblok Div. of American Brake Shoe Co., Detroit, was recently elected a vice president of American Brake Shoe Co., New York, N. Y. His new appointment is in addition to his position as president of the Brakeblok Div.

R. D. Ulrey has become manager of the Los Angeles office of Joshua Hendy

Iron Wks., Crocker-Wheeler Electric Div., which is located at 523 W. Sixth St. This new office provides coverage for southern California, Arizona and New Mexico.

Arthur S. Brown has been appointed sales manager of Scott Aviation Corp., Lancaster, N. Y., makers of aircraft accessories and high altitude oxygen equipment.

BUSINESS ITEMS

Cincinnati Planer Co., Cincinnati, Ohio, has appointed exclusive sales representatives in the north east. They include Harrington-Wilson-Brown Co., Chrysler Bldg., New York, N. Y., for northern New Jersey, eastern New York and Connecticut; Lynd-Farquhar Co., Park Square Bldg., Boston, for Massachusetts, Rhode Island, New Hampshire, Vermont and Maine; C. H. Briggs Machine Tool Co., Onondaga Hotel, Syracuse, N. Y., for the Syracuse area; and George Keller Machinery Co., 1807 Elmwood Ave., Buffalo, for western New York.

Detroit Tap & Tool Co., Detroit, has added four more district offices in Ohio, Pennsylvania and Indiana. The additional Ohio office is located at 1409 Union Central Bldg., Cincinnati, with E. W. Brock as district manager. An office at 601 Tower Bldg., South Bend, is headed by T. S. Mellen, while J. R. Armstrong is district manager of the Indianapolis office at 1109 Fletcher Trust Bldg. A branch office at 1217 Grant Bldg. is headed by A. Olson.

Tungsten Carbide Tool Co., Detroit, has opened seven district offices to serve industrial plants in the Middle West. The offices are located at 1409 Union Central Bldg., Cincinnati; 710 Harries Bldg., Dayton; 1306 Toledo Trust Bldg., Toledo; 431 Penton Bldg., Cleveland; 601 Tower Bldg., S. Bend; 1009 Fletcher Trust Bldg., Indianapolis; and 1217 Grant Bldg., Pittsburgh.

Dow Chemical Co., Midland, Mich., has opened Philadelphia and New England sales offices. The Philadelphia office at 1400 S. Penn Sq. is headed by Alexander Leith, Jr., who has been with Dow's New York sales office since 1923. Alfred A. Lawrence, who has been connected with the firm since 1940, has been selected as manager of the office at 20 Providence St., Boston.

American Screw Co., Detroit, has moved from the General Motors Bldg. to Room 502 Stephenson Bldg.

L & R Mfg. Co., Arlington, N. J., producers of cleaning machines and solutions, has established a Chicago sales office under the supervision of John Willard Denniston. The office is located in the Pittsfield Bldg., 55 E. Washington St. Mr. Denniston will cover the states of Minnesota, Iowa, Missouri, Kentucky, Wisconsin, Illinois, Michigan, West Virginia, Indiana, Ohio, western Pennsylvania and Tennessee.

American Brake Shoe Co., Kellogg Div., has acquired the Crown Spray Gun Mfg. Co. of Los Angeles. H. O. Winkler, president of Crown Spray Gun, becomes vice president of the Kellogg Div., in charge of the Crown operation. This plant, which has been in operation since 1913, manufactures a line of spray guns and paint spray equipment.

Producto Co., Merchants Bank Bldg., Indianapolis, has been organized to manufacture machine tools, jigs, dies and similar equipment.

The formation of the Mec-Rad Div. of Black Industries, Cleveland, to manufacture the mechanical components of all types of radionic devices, has recently been announced by Franklin G. Gepfert, chairman of the board. This division is under the supervision of John Altmayer.

OBITUARIES

Paul C. De Wolf

Paul Churchill De Wolf, 61, vice president of Brown & Sharpe Mfg. Co., Providence, R. I., died after being stricken with pneumonia at his home recently. After graduation from Brown University in 1905 Mr. De Wolf became associated with Brown & Sharpe, and following an apprenticeship of two years he was made assistant superintendent of the small tool department. Two years later he was transferred to the sales office where he directed the sales of the foundry and gear departments. Mr. De Wolf entered the administrative branch of the company in 1913, becoming vice president in 1924. He was elected president of the National Metal Trades Assn. in 1924, and was also at one time a secretary of the Machinery & Allied Products Institute.

Edwin De Witt Coddington, 78, of Woodbury, Conn., manufacturer, engineer and inventor, died recently after a brief illness. In 1893 he joined Wisconsin Bridge & Iron Co., N. Milwaukee, of which he was vice president and a director until 1941. Mr. Coddington became vice president in charge of production and development of the Reynolds Corp. in New York City in 1935. Since 1942 he had been vice president of Eastern Temperature Control Co. He invented machines for improving the fabrication of iron and steel, including riveters, punching machines and reamers.

Glen Holt, Sr., 47, vice president of Perfex Corp., Milwaukee, was killed in a hunting accident near Long Lake, Wis.

Frank A. Hoster, Philadelphia branch manager for Snap-On Tool Corp., Kenosha, Wis., passed away at his home a short time ago.

Frank P. Miller

Frank P. Miller, president and treasurer of McCrosky Tool Corp., Meadville, Pa., passed away suddenly of a heart attack at his home. Mr. Miller had been associated with the organization for 36 years. He began as a sales engineer in 1907, becoming general manager one year later and president and treasurer in 1922. He was a successful inventor and many of the metal cutting tools and machine tool attachments manufactured by McCrosky are the result of his inventions.

William F. James, recently general manager of the South Philadelphia Wks. of Westinghouse Electric & Mfg. Co., died at his home after a long illness. He was 64 years old. Mr. James joined Westinghouse in 1909 and spent his entire business career with that company.

Stewart McNaughton, 61, sales manager in charge of steam locomotives for Baldwin Locomotive Wks., Philadelphia, passed away following a brief illness.

MEETINGS

American Society of Tool Engineers. Annual meeting. Bellevue Stratford Hotel, Philadelphia. Mar. 26-27.

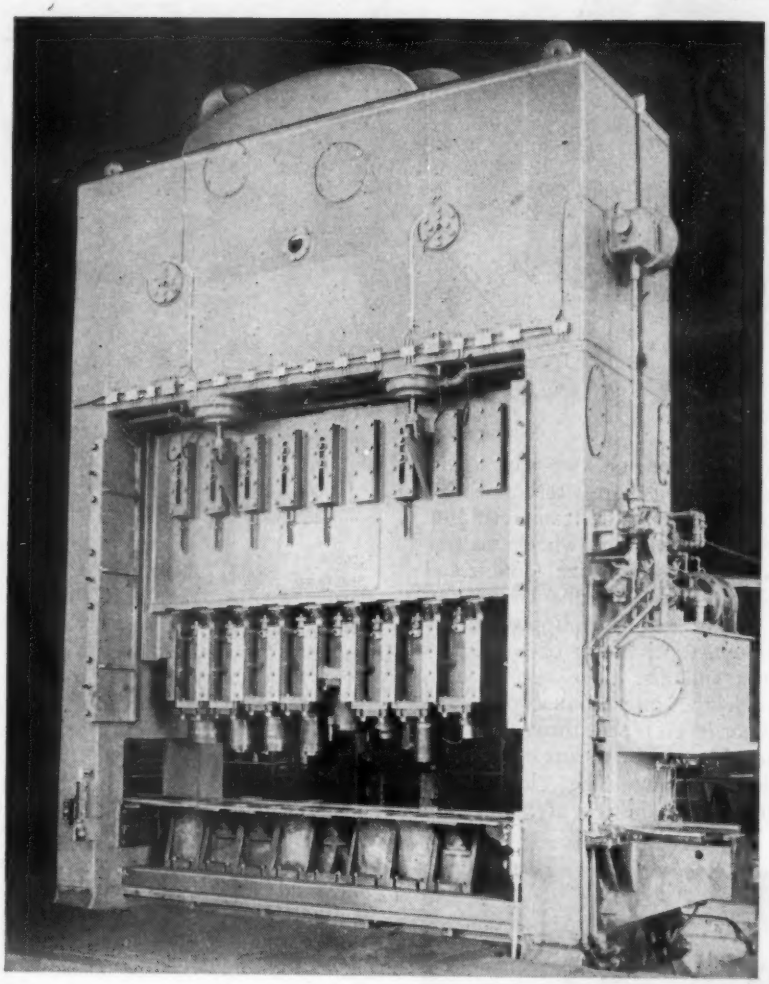
American Management Assn. Annual Conference of Personnel. Palmer House, Chicago, Ill. Feb. 9-11.

National Screw Machine Products Assn. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. Jan. 27-28.

Society of Automotive Engineers. Annual meeting. Book-Cadillac Hotel. Detroit, Mich. Jan. 10-14.

Shop Equipment News

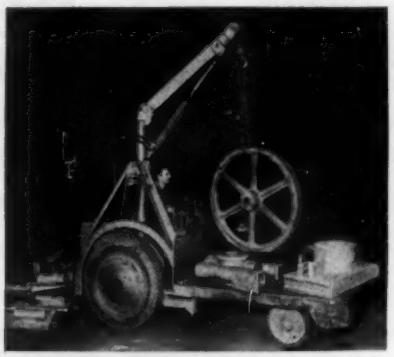
Verson Full Eccentric Feed Press Equipped With Nine Interchangeable, Adjustable Working Stations



Verson Allsteel Press Co., 9306 South Kenwood Ave., Chicago, Ill., has produced a full eccentric transfer feed press equipped with nine time stations. It will blank, draw, redraw, pierce, size and emboss 720 filters per hour according to the manufacturer. This machine has a capacity of 500 tons and measures 138 in. between the housings. All working stations are interchangeable and individually adjustable. A broad range of sizes and tonnage capacities is available.

Two points of force application insure an even distribution of pressure across the entire slide area. It is said that full eccentric construction of this press provides a maximum factor against shaft failure, the split cap design bronze-bushed main bearings permit easy renewal and quick adjustment, and that an extra long full-thrust eccentric strap reduces friction between the gibs and slide. Barrel type adjusting screws, equipped with buttress threads, remain vertical at all positions of the stroke.

The press is designed for producing, such parts as coaster wagons, cooking utensils, stone sections and other commodities of regular shape.



Hi-Way Go-Devil Tractor Crane For Indoor and Outdoor Use

A tractor crane, known as the Drott Go-Devil, has been developed by Hi-Way Service Corp., 3841 West Wisconsin Ave., Milwaukee 8, Wis. It is hydraucially operated and steered and may be turned with loaded platform without effort on the part of the operator. All controls are within easy reach and all functions are handled from the seat.

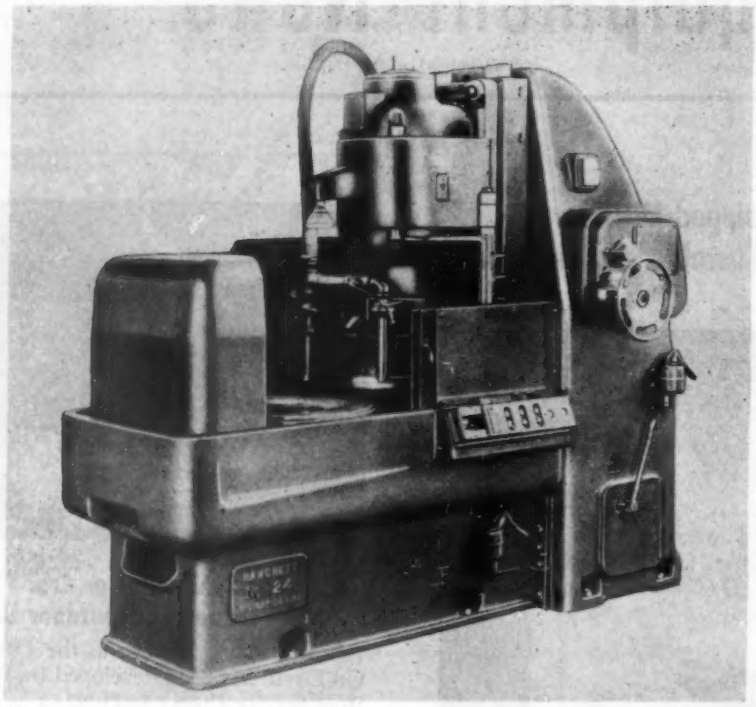
This crane has large pneumatic tires in the rear and oversize solid front tires and can be used either indoors or outdoors. The boom handles loads weighing up to 2,000 lb. Outriggers prevent the outfit from tipping under the heavier loads.

Sta-Safe Eyemask and Hairgard Feature Several Improvements

Two improved safety devices for women workers have been brought out by Standard Safety Equipment Co., 232 West Ontario St., Chicago, Ill. One is the plastic Sta-Safe eyemask which has extra ventilation provided by perforations above and below the vision area. Other features are its unusual impact resistance and non-flammable property. The eyemask is available in clear or green anti-glare models.

The Sta-Safe Hairgard resembles the French Foreign Legion headgear, and covers all the hair. It is adjustable and comes in ivory or blue with red, blue, green or white trim around the visor. The hair guard is such that it may be imprinted with company trademark or departmental number or emblem.

Hanchett No. 24 Vertical Rotary Surface Grinder Provides Hand, Power or Automatic Traverse to Head



Hanchett Manufacturing Co., Big Rapids, Mich., has produced the No. 24 vertical spindle rotary surface grinder. The structural proportions of this model are considerably heavier and stronger than conventional type machines of equal capacity, it is claimed.

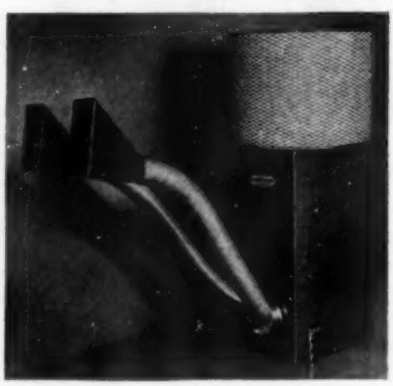
The 30 in. rotary magnetic chuck is equipped with a Neu-T-Rol demagnetizing switch and is traversed into grinding position by pushbutton control. The grinding wheel head has hand, power or automatic traverse. Power is furnished by a 2 hp. 900 r.p.m. motor.

The motor driven wet grinding system includes a coolant pump driven by a ½ hp. motor. This grinder is equipped with a swing arm wheel dresser, ammeter for determining the cutting action of the grinding wheel, floodlight and other accessories to aid in grinding to close tolerances.

Dustkop Dust Collector Has Filter and Separator

Model 950 Dustkop, made by Aget-Detroit Co., 601 First National Bldg., Ann Arbor, Mich., is a portable, self-contained dust collector which features a cyclone separator and filter combination. This unit is light in weight and requires less than 2 sq. ft. of floor space. It can be supplied with either one-or two-way inlets. This model Dustkop is recommended for collecting dust from grinding operations on big wheel surface grinders, medium size double-end grinders, disks, cut-offs, emery and belt sanders. It is equipped with a continuous duty motor of 1/3 hp.

Dust and dirt laden air, taken in through the inlet connections near the floor level, is sent through the cyclone separator by means of a multiple-bladed fan. The cleaned air emerges from the top of the cyclone



and is returned to the working space after passing through the spun glass filter which forms the upper portion of the collector. The dust drops into the glass storage jar fastened to the lower end of the cyclone cone. Doors on both sides of the cabinet permit easy access to the dust storage.

The fan, motor and cyclone separator are inclosed in the cabinet which forms the base of the unit. The drum top, which consists of the filter, can be removed for inspection or cleaning.

Acromark No. 50 Machine For Marking Round Parts

The No. 50 rotary marking machine has been made available by Acromark Co., 9-13 Morrell St., Elizabeth, N. J., for marking parts that can be rolled. The machine is equipped with a 1½ hp. gear reduction motor

with extended shaft on which is mounted the marking roll.

Two pillar blocks support the oversize shaft with heavy roller or ball bearings to support the marking strain. The switch box on the machine controls the motor, and a transparent Lucite guard covers the marking roll fr safety.

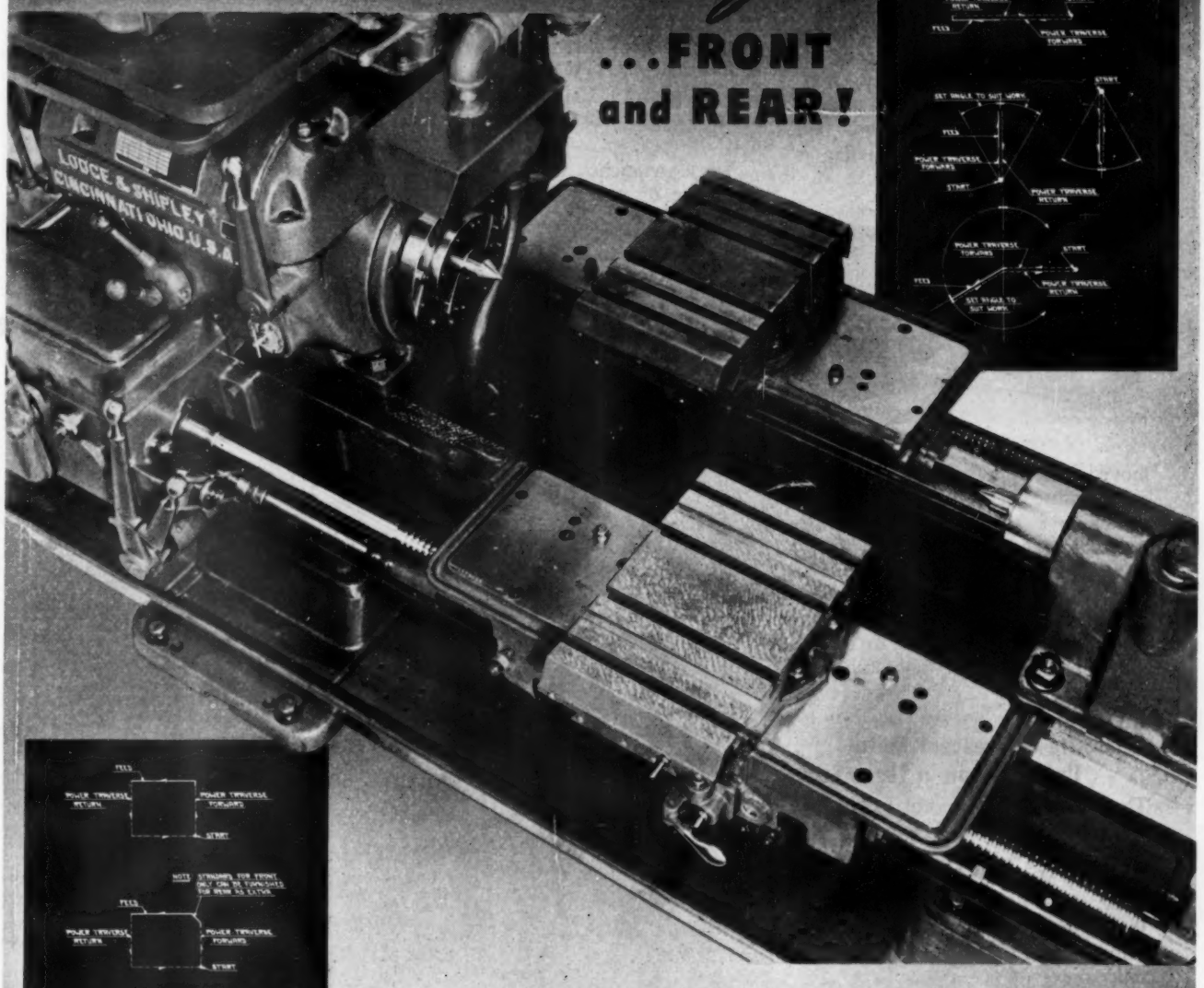
The wedge type cradle rolls are controlled by a hand lever that brings the work into position against the continuous rotation of the marking roll. The work table of this machine is designed to suit the average workman's height.

Tagliabue Makes Celectray Electronic Controller

The Celectray electronic pneumatic indicating controller developed by C. J. Tagliabue Manufacturing Co., Park & Nostrand Aves., Brooklyn 5, N. Y., does not employ a motor or other continuously moving parts.

The measuring circuit in this instrument, including the galvanometer and the photoelectric system, are identical with the standard Celectray

Standard Cycles ...FRONT and REAR!



Oct. 8, 1943
Feb. 23, 1943
Aug. 23, 1942
March 6, 1942

THE No. 3-A DUOMATIC LATHE is a full automatic lathe for the advantageous use of multiple tools in turning and straight and angular facing operations. It is particularly adapted to quantity production of lathe work in small or large lots whether between centers on an arbor or in suitable chucks or fixtures.

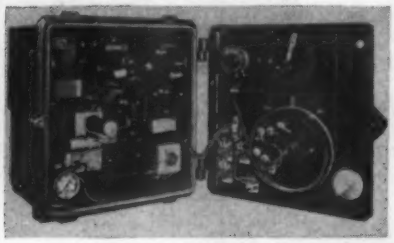
Write for Descriptive Booklet, No. 601-FL.

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.
ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

controller. However, in place of the relay found in that controller a magnetic air valve has been substituted which acts as an amplifier and converter from electric to pneumatic operation.

On-and-off or open-and-shut control is available in two models, together with high sensitivity, non-adjustable throttling or on-and-off without throttling.

The light beam follow-up flag is



moved back and forth by changes of air pressure in the bellows of the follow-up assembly unless the sensitivity-adjusting arm is turned to the highest sensitivity on its scale. As the temperature varies, the light image moves across the controlling edge of the flag and more or less of the light reaches the phototube.

Aristolite Fluorescent Metal Unit Is Made in Three Sizes

The Aristolite fluorescent fixture has been announced by Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo. It is available in sizes for 2-40, 3-40 and 4-40 watt lamps. It is the first design under W.P.B. rules permitting the use of metal in reflectors.

Lens design glass is used in the fixture. The glass panels are removable for servicing and relamping. The steel housing totally incloses all accessories and wiring. Its end design permits flush abutment of units when continuous installations are desired. The Aristolite can be suspended, or can be mounted near the ceiling. Full diffusion of light rays reduces reflected glare.

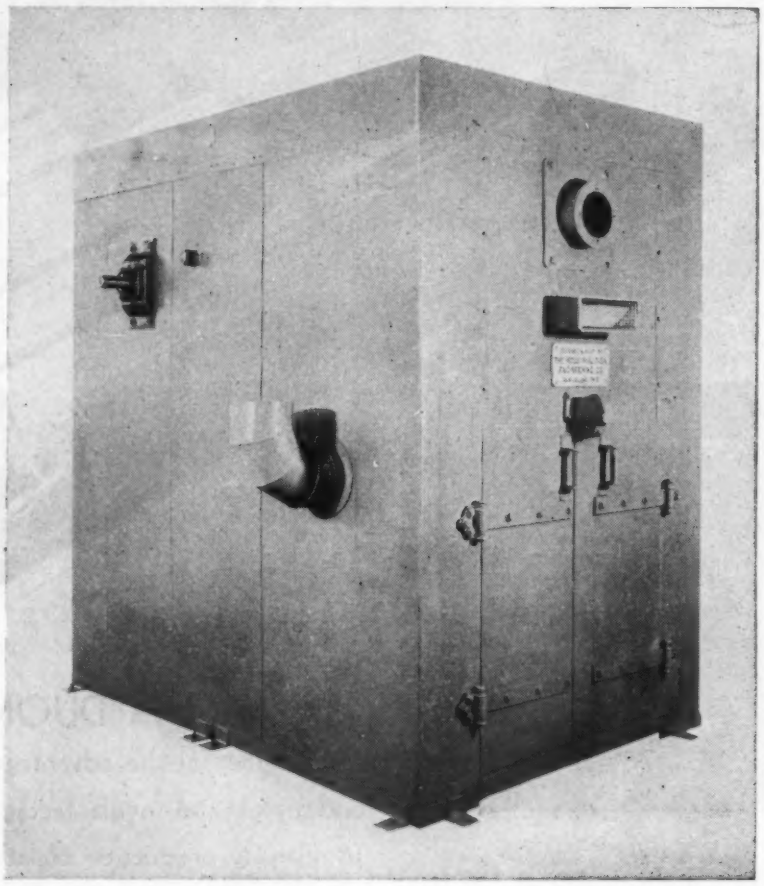
Joar Conduit Wrench For Tightening Fittings

Joar conduit wrenches for tightening knurled or serrated fittings for conduit, conduit plugs and tubing are being manufactured by Jo Manufacturing Co. and distributed by Joyce & Associates, 819 Washington Bldg., Los Angeles 13, Calif. Various sizes are available to cover all standard aircraft fittings.

These wrenches may be used in clockwise or counterclockwise direc-

tion as they are self-racheting. The tool comprises a broached jaw which encircles the fitting, and with a slight jack-knife action a shoe slides forward to engage the fitting against the jaw. Its design permits access to fittings in small working quarters.

Industrial Box Type Oven for Batch Heating Purposes Feature Close-Limit Temperature Control Tolerances



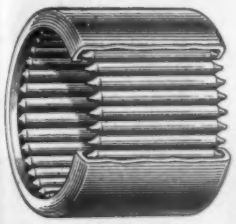
A box type oven in several standard sizes for a variety of batch heating purposes is being offered by Industrial Oven Engineering Co., 11621 Detroit Ave., Cleveland, Ohio. Door sizes range from 3 ft. wide by 5 ft. high to 5 ft. wide by 7 ft. high, with working depths from 4 to 10 ft.

The heating equipment is built into the oven shell, and the oven is shipped assembled. Likewise the duct work is built in and is arranged for crossflow and vertical air passage. Recirculation and exhaust ducts are arranged to prevent belching or leaking at the door opening.

One of the principle features of this oven is close temperature tolerance within limits from 200 to 1,000 F. On high temperature units, inside panels are made of steel plates with the heat affected parts of chrome and chrome nickel alloys. Ovens can be furnished with or without positive exhaust fan systems.

Standard temperature controls are

Yes, these are ALL Needle Bearings ...



TYPE DC

TYPE NCS

DESIGNED FOR TODAY'S NEEDS AND TOMORROW'S TRENDS—THEY OFFER A UNIQUE COMBINATION OF ADVANTAGES

You may not have realized how many *different* types of Needle Bearings have been developed since the first Torrington Needle Bearing was introduced.

Some of them are illustrated here.

Common Advantages

All of them employ the basic principle of a full complement of small diameter needle rollers within a single, compact retaining raceway. And all of them offer the characteristic advantages of the original Torrington Needle Bearing:

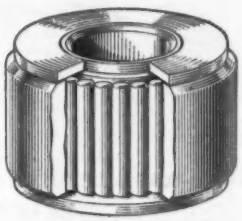
1. Small size, light weight and compact design
2. High radial load capacity and elimination of stress concentration
3. Unit construction which facilitates handling and installation
4. Efficient lubrication; freedom from maintenance attention
5. Low cost

For Special Requirements

Each of the "newer" types is designed for a particular task . . . a particular set of conditions.

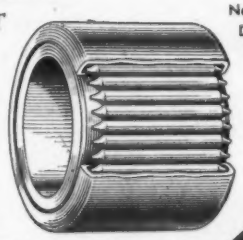
Some of them were so well established even before the war as to be almost universally used for certain applications. For example, the NCS Type Needle Bearing, of rugged construction, designed for heavy service, and available in standard sizes to fit an inner race of from ⅝" O.D. to 5½" O.D., is widely employed in equipment for the oil industry where service conditions are severe and rough "handling" the rule.

Others are the result of wartime demands for greater efficiency in speeding production lines and stepping up performance records. The AT Type Needle Bearing, for instance, has a heavy, through hardened outer race designed to give maximum capacity obtainable from the rollers



TYPE AT

used. It has found wide application in the aircraft construction where it is used with standard AN bolts and is designed to have a static non-Brinell capacity equal to the single shear strength of the bolt. Standard sizes in the AT Type range from 0.1900 to 1.0000" to fit on bolts No. 3 to 16.



DC (INNER RACE)

For Postwar Designs

Where the efficiency of anti-friction operation is desired, and space, weight and cost are vitally important considerations—as they will be in designing to meet postwar trends—Needle Bearings provide the answer!

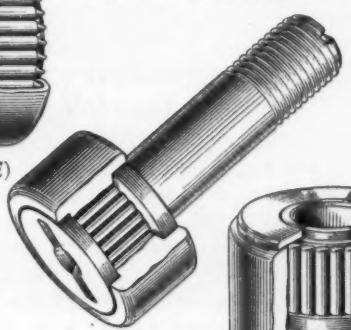
With the development of a complete line of all types, The Torrington Company offers the product designer and engineer a selection to meet virtually *any radial load requirement*. The experience of Torrington engineers is available to aid in design and application of Needle Bearings to *your* particular job. A copy of our current Catalog No. 105 will give you an outline of the types, sizes and capacities currently available for essential needs. And if our engineering staff can assist in selecting the right type for a particular job, write, outlining your need.

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

"Makers of Needle Bearings and Needle Bearing Rollers"

New York Boston Philadelphia
Detroit Cleveland Seattle
San Francisco Los Angeles
Chicago Toronto London, England

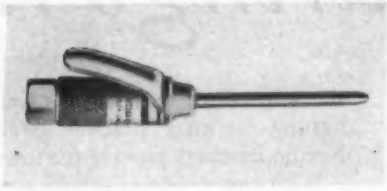


TYPE RC

TYPE FDT

TORRINGTON
NEEDLE BEARINGS

either expansion recording thermometer or millivoltmeter type, depending on the accuracy of control required. Electric safety equipment protects the system against flame, current or air failure.



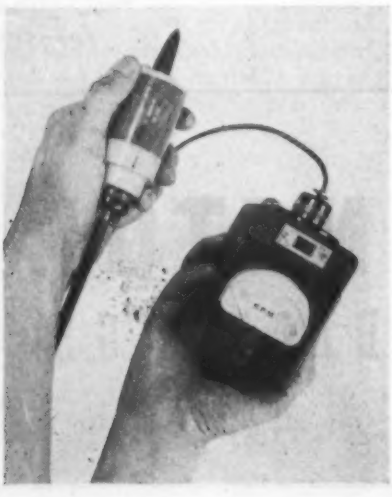
Decora Air Duster Blowgun Removes Filings and Grit

An air-duster blowgun has been designed by Decora Manufacturing Co., 1823 Fifth St., Berkeley 2, Calif. It is suited for cleaning machinery, removing metal filings, chips, grit and moisture, or for cleaning shop equipment and benches. This gun is available with a choice of 5/64 or 1/8 in. nozzle orifice, and is made of steel and brass.

The lever type trigger action permits positive and graduated control of air volume. This trigger serves also as a hook for hanging the tool and hose in an accessible location. The air washers can be replaced by a standard Schrader chuck washer.

Ideal Electric Tachometer Is Hand or Separable Type

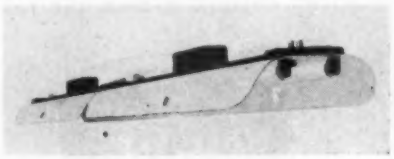
A self-energized electric tachometer for checking production speeds is being offered by Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill. It consists of a small generator coupled to an electric meter. The complete unit measures 3 × 7½ × 2½ in. and weighs 3 lb. It is available in two sizes for speeds up to 5,000 r.p.m. It is accurate to ± 1 percent of full scale deflection.



The generator consists of a small, permanent magnet rotor mounted on ball bearings and capable of continuous operation at any speed within the limit of the meter. It measures 1⅝ in. in diameter and 3¾ in. long.

The indicating instrument is a rectifier type and is provided with two scales—"Hi" and "Lo", indicating maximum reading obtainable (2,500 or 5,000 r.p.m.). This meter measures 3 × 4¼ × 2½ in.

Both elements are separate units and coupled together by a bayonet lock. They may be used together as a hand type tachometer, or separately and connected by a two conductor electric cord. A 5 ft. cord complete with coupling plug is provided.



Westinghouse Luminaire For Strip Installation

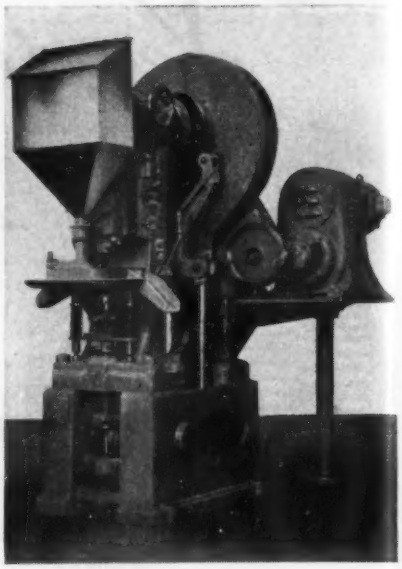
For continuous strip installation, Westinghouse Electric & Manufacturing Co., Lighting Div., Edgewater Park, Cleveland, Ohio, has available a lightweight fluorescent Luminaire with one-piece, double-length hood and two full size reflectors. The Type F N C Luminaire is supplied for use with four or six 40 watt or four 100 watt lamps.

The hood is fabricated from sheet steel, with all ballasts, lamp holders and starter sockets mounted and wired as part of the channel assembly. Sliding hangers permit suspension from any part of the hood. Mounting arrangements are available for any application.

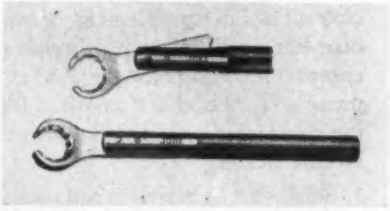
Stokes High Capacity Press For Powdered Metal Parts

For power metallurgy and dry pressing of ceramics, F. J. Stokes Machine Co., Tabor Road, Philadelphia 20, Pa., has built the Model T-4 high capacity press. Pieces up to 2½ in. diameter with a diefill of 1⅝ in. can be compressed by this machine at rates of 20 to 60 per min.

Pressures up to 12 tons are applied from both top and bottom, and pressure adjustments may be made while the machine is operating. Thus density in the piece produced may be controlled with exactness, to assure uniform electrical and mechanical characteristics. For example, either the desired porosity in oil-impregnated bearings or the extreme density necessary in a hard carbide toolbit is readily obtainable.



Features of this press include separate ejection and compression levers; screw adjustment for compression; independent ejection cam; clutch and combined brake that instantly starts and stops the machine, even under full compression load; variable speed drive and adjustable gibs.



Jobe Bolt Tension Wrench Set for Repeated Torquing

For tightening nuts, bolts and tubing fittings, Joyce & Associates, 819 Washington Bldg., Los Angeles 13, Calif., is offering the Jobe tension wrench. This tool comes in various sizes with torque settings as required.

It has been designed to meet the need for a wrench where repeated torquing at the same torque load is required. The wrench is set at a given torque which cannot be changed except by the toolcrib man. When the proper torque is attained, the wrench snaps open. When the load is released, the wrench snaps back to neutral. For tightening wing nuts on hose clamps, a special adaptor can also be used.

Standard Carboloy Tool Prices Now Generally Comparable to All Types of Cutting Tool Materials

THE STEADY INCREASE in acceptance of of Standard Carboloy Tools has made possible constant improvement in our quantity manufacturing technique to the point where highly efficient single-purpose equipment has been developed for practically all operations, effecting substantial economies in our mass production methods.

This has made possible a further price reduction—effective December 6, 1943—in the price of single point Standard Carboloy Tools to a level where they are now generally comparable, in price, with tools made of *ALL* types of cutting materials. These new, low prices now justify—more than ever before—your review of all single point tool turning, boring and facing applications not at present receiving the benefits of carbide use—in terms of increased production, faster machining speeds, better finish, longer tool life and lower cost per piece produced.

Send for revised price list covering 10 Standard Styles, 5 Standard Grades, for cutting steel, cast iron, non-ferrous metals, etc.

CARBOLOY COMPANY, INC., 11147 E. 8 MILE BLVD., DETROIT 32, MICHIGAN

Birmingham · Chicago · Cleveland · Los Angeles · Newark · Philadelphia · Pittsburgh · Seattle · Thomaston, Conn.

CANADIAN DISTRIBUTOR: Canadian General Electric Company, Ltd., Toronto, Ont.

FOREIGN SALES: International General Electric Company, Schenectady, N. Y.

CARBOLOY

TRADEMARK

For Cutting CAST IRON and Non-Ferrous Metals

For Cutting STEEL

TUNGSTEN CARBIDES * TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES**

G.E. Dry Type Transformer Provides Ease of Installation

The indoor dry type transformer for primary circuits 601 to 15,000 volts, made by General Electric Co., Schenectady, N. Y., has been designed to provide greater safety and ease of in-

stallation. Deeply pitched louvers on each side of the case provide an outlet for the cooling air, which is circulated through and around the coils by convection. Ample air intake for free ventilation is provided by the screened opening along the bottom of each side. The unit has rounded corners and two-tone gray finish.

Horizontally louvered sections on two sides of the case can be removed for interior cleaning and tap changing. The taps are brought to a convenient terminal board located below the edge of the casing.

All live parts are metal inclosed, various portions of the case being separately removable. To facilitate connecting the transformer to the circuit, the high voltage terminal compartment cover can be removed. The low voltage compartment cover is also removable for access to the low voltage terminals. The plates on each side of the transformer are also removable as well as the top section at each end of the case. Length of the transformers is about twice the width to permit installation in dead spaces between pillars of a building or in out-of-the-way corners on the plant floor.

Trimount Electrical Control Governs Level of Materials

Trimount Instrument Company, 37 W. Van Buren St., Chicago 5, Ill., is offering a non-mechanical level control, which maintains the level of any liquid or electrically conducting solid

within an open or closed tank, bin, hopper or other container. The control signals the level of material and can be installed to operate solenoid or motor-driven electrical devices.

The device can be installed in evaporators, freezers, boilers or other containers involving extreme temperatures and can be used to control the level of metal chips and chemicals.

Industrial-Air Compressor Is for Specialized Needs

Sullivan Machinery Co., Michigan City, Ind., has developed the Industrial-Air Compressor, Class WG-9, for use in small industries or for the specialized requirements of other plants. The unit is designed for heavy-duty 24 hour per day service.

This single stage compressor is a double acting water cooled vertical unit which has exceptional capacity in relation to the floor space required for its installation. Large air passages throughout the Industrial-Air provide unrestricted air flow from intake to discharge. Truncated piston design results in large valve and head radiation area. Valve assemblies are easily accessible for inspection.

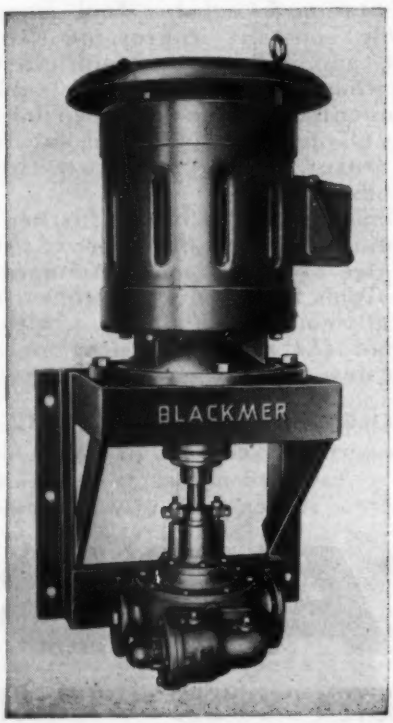
Because of its running characteristics and the small floor area required, the WG-9 needs only a simple block type foundation which can be easily installed in any unused space. Automatic stop and start control can be furnished with this unit, if required, for any specialized or intermittent operation.

Blackmer Rotary Pump Has Bracket Mounting

A marine type rotary pump with built-in relief valve has been made available by Blackmer Pump Co., Grand Rapids 9, Mich. While the unit has been developed for handling Navy lube oil, the type of mounting is suited for many applications in industrial and processing plants.

This pump, which operates on the swinging vane principle, has a capacity of 50 gal. per min. at a discharge pressure of 20 lb. per sq. in. It is direct connected to a 3 hp. motor by a flexible coupling. The bearings are internal anti-friction type. A split gland is used for ease in repacking.

The motor is supported by a bracket of welded steel plate, and the pump is mounted vertically on the base of the bracket, permitting easy access for lubrication and adjustments.



The illustration shows a Baldwin Southwark straightening press at work in one of our country's largest Navy yards.

THE NAVY KNOWS HOW

Choosing the proper equipment to achieve a desirable result is not an easy task. The U. S. Navy knows how, as a glorious history indicates. It is tribute to Baldwin Southwark presses to find the Navy placing many of these presses in Navy yards throughout the country.

Baldwin Southwark shipyard equipment includes bending rolls, joggling presses, plate planers and keel benders.

Baldwin Southwark also produces hydraulic press equipment for all types of industries. The Baldwin Locomotive Works, Baldwin Southwark Div., Philadelphia, Pennsylvania, U. S. A.

BLW THE BALDWIN GROUP

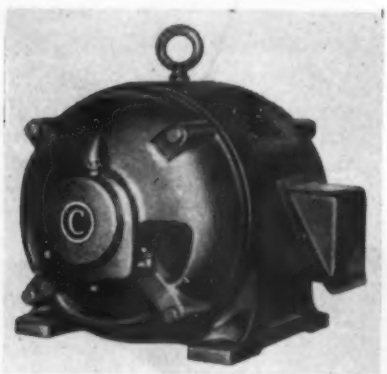
BALDWIN
SOUTHWARK
HYDRAULIC PRESSES

Parts and Materials

Century General Purpose Motor Built in Protected Design

Form J general purpose, open rated motor, is now being produced by Century Electric Co., 1806 Pine St., St. Louis 3, Mo., in a protected design. It is available in sizes from 1½ to 15 hp.

The upper half of the end bracket is closed to minimize the possibility of dripping liquids or falling solids from entering vital parts of the motor. Two fans located behind the



bearing brackets draw cooling air through the bearing bracket openings, around the bearings, across the windings and to the air passages between the outer surfaces of the magnetic core and the frame. The heated air is expelled through openings at the side and bottom of the frame.

Castolin Eutectic Alloy Fills Cracks in Castings

Castolin Eutectic alloy No. 1900 has been made available by Eutectic Welding Alloys Co., 40 Worth St., New York, N. Y., for filling and adding metal on castings and parts which have become broken, cracked, porous or otherwise defective. The alloy is also suited for joining magnesium sheets to castings, correcting machining errors and filling blowholes.

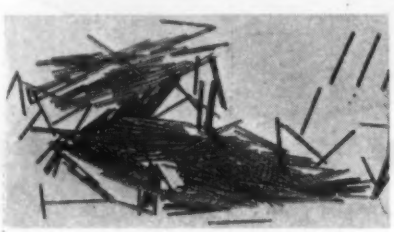
This flux is supplied in 3/16 in. rods with orange tips. It has a binding temperature of 960 to 1,060 F., and tensile strength of 29,000 lb. per sq. in. It is said that Castolin Eutectic alloy No. 1900 gives welds which contain a high amount of magnesium and aluminum. It binds on magnesium alloys at a temperature slightly below the melting point.

Noviweld-Didymium Lenses In Lighter Shade for Welders

A No. 3 shade of Noviweld-Didymium lenses for flame welders is now available from American Optical Co., Southbridge, Mass. This lighter shade is particularly suited for welders working on aluminum. It is said that these lenses absorb sodium flare and that the glass protects eyes against ultra-violet and infra-red radiation. The lenses preserve orange and red color values so that the welder can see the red hot bead and the molten metal in brillant colors.

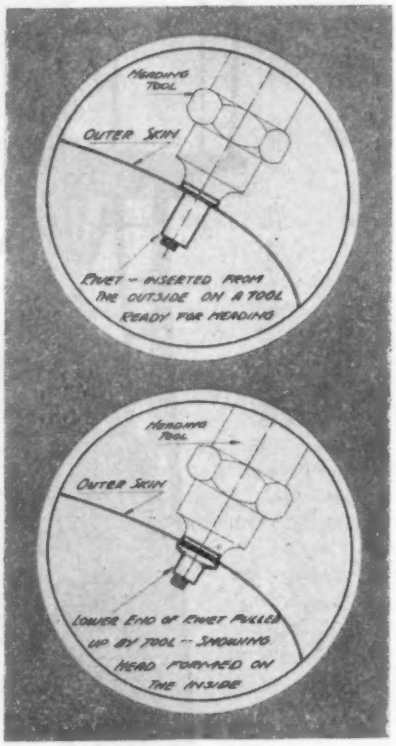
Haynes Stellite Offers Alloy For Use in Small Mechanisms

Stellite alloy is being offered by Haynes Stellite Co., Kokomo, Ind., for use in small mechanisms and instruments. This alloy is composed of tungsten, chromium and cobalt,



and is furnished in many cast forms, such as pins for pivots and shafts.

It is said that this stainless metal is resistant to corrosion and normal atmospheric conditions. Stellite alloy has a tensile strength of about 65,000 lb. per sq. in., a hardness of Rockwell 60C to 62C, and is claimed to have high resistance to wear and low coefficient of friction. The alloy can be readily brazed or welded to steel or other base metals for use in instruments or mechanisms where wear resistant parts are needed.


HEADING TOOL
OUTER SKIN
RIVET – INSERTED FROM THE OUTSIDE ON A TOOL READY FOR HEADING
HEADING TOOL
OUTER SKIN
LOWER END OF RIVET PULLED UP BY TOOL – SHOWING HEAD FORMED ON THE INSIDE

Goodrich Rivnuts Available For General Industrial Use

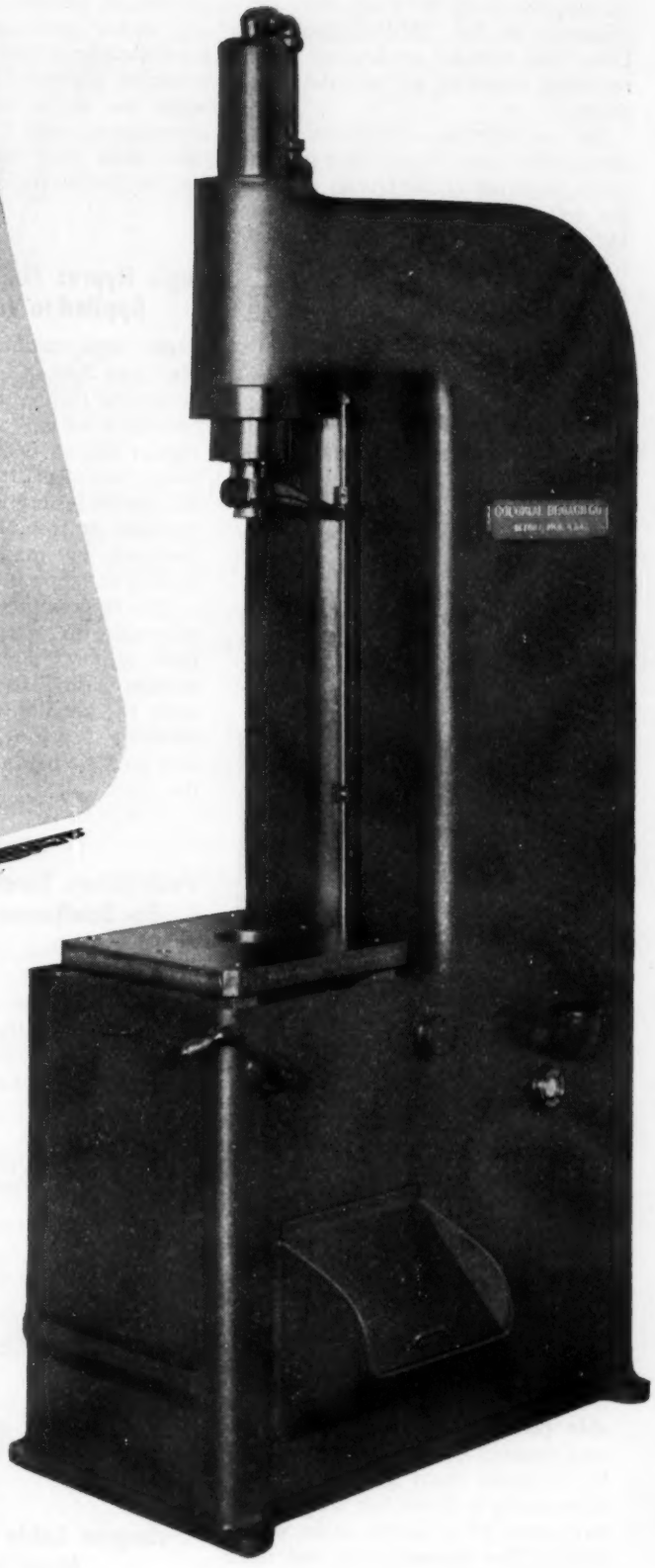
B. F. Goodrich Co., Akron, Ohio, has made rivnuts available for general industrial use. This one-piece combination rivet and nut plate was originally developed to fasten rubber de-icers to airplane wings. Rivnuts are made of aluminum alloy, which is claimed will not crack or fracture and has high corrosion resistance. Rivnuts do not require heat-treatment before use.

The device is a threaded, tubular rivet which can be headed while working from the other side. It may also be used as a straight rivet, permanently headed on both sides, and the interior threading permits insertion of a screw so that the parts can be separated later.

Cellophane Used to Retain Coldness of Aluminum Rivets

The use of cellophane bags for handling ice cold aluminum rivets is saving time and money in several of the aircraft plants according to an

11
COLONIAL
SURFACE BROACHING
MACHINES
now do the job of
60
MILLING MACHINES
in producing
66
DIFFERENT PARTS
in
13
OPERATIONS
EACH



You can figure for yourself what that means in the way of flexibility and of savings in manpower, capital investment and manufacturing cost. However, if you would like the whole story, ask for a copy of Colonial's

BROACHING NEWS, Vol. 5, No. 4

(Right) One of the most flexible of machines, this Utility Press—one of the machine types referred to above—may be used for both broaching and other types of press work. It is thus well adapted to the requirements of the smaller or medium-sized shop as well as where higher production is required.

colonial BROACH COMPANY
DETROIT 13, U.S.A.
Broaches Broaching Machines - Broaching Equipment

announcement by E. I. du Pont de Nemours & Co., Wilmington 98, Del. This wartime application saves resorting, reheating and recooling the rivets.

By use of the cellophane bags enough insulation is provided so that rivets taken out of the freezer cabinet but left in the bag can be used as long as an hour or an hour and a half later. Since each bag contains rivets of one size only, the returns are less likely to become mixed, and resorting time is thus reduced.

G.E. Arc Welding Spotlight Provides Glareless Light

General Electric Co., Electric Welding Div., Schenectady, N. Y., has designed a spotlight for arc welding operators to provide glareless illumination. The spotlight consists of three 300 watt reflector spot lamps surrounded by a circular shade and is mounted on an upright, telescoping metal standard set in an 18½ in. diameter cast iron base.

The lamps are mounted in adjustable porcelain holders so that the area covered by the light beam can be increased from a spot 7 in. in diameter to a clover leaf shaped pattern about 17 in. across at its widest point. The operator does not need to lift his helmet before striking the arc, thus increasing production by saving time and reducing fatigue.

A locking thumb screw holds the light in position at any point on the standard from 45 to 76 in. above the base. A universal, friction ball joint between the shade and upright standard permits the light beam to be directed and held at any angle downward between vertical and 30 deg. below horizontal. The unit is controlled by a foot operated switch which is depressed by the operator while the arc is struck. The light is equipped with a 10 ft. oilproof cable with plug for connecting the light to the electric circuit.

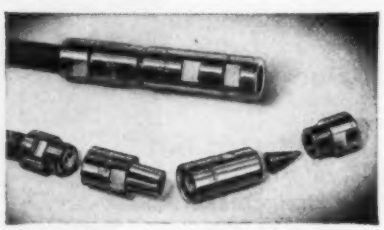
Engis Hyprez Finish Process Applied to Variety of Shapes

Engis Equipment Co., 310 South Michigan Ave., Chicago 4, Ill., has developed Hyprez finish for application to a variety of special and irregular shapes, both external and internal surfaces. It is claimed that this method eliminates scratches and provides uniform finish on surfaces prepared by machining, grinding, honing or lapping.

The Hyprez process is particularly adaptable to straight and tapered holes or bores, and to contours. The amount of stock to be removed varies with the quality of surface before finishing, depth of deepest imperfection and the hardness and quality of the piece.

Post Offers Three Slide Rules For Draftsman and Apprentice

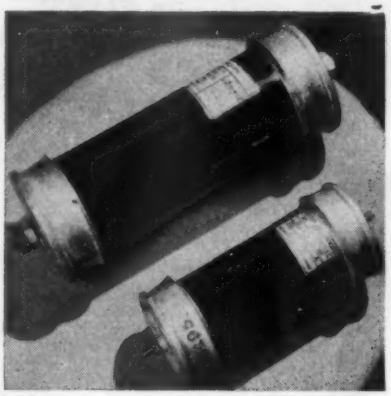
Frederick Post Co., P. O. Box 803, Chicago 90, Ill., is offering three slide rules. One is suited for the professional draftsman, one for the apprentice draftsman or student, and the other is a handy 5 in. pocket slide rule. All of these rules contain the scales A,B,C,D,CI,K.S,L and T. The apprentice rule has a painted face while the others are celluloid faced.



Palmgren Cable Connectors Made in Solderless Type

Palmgren solderless cable connectors are being offered by Chicago Tool & Engineering Co., 8354 South Chicago Ave., Chicago 17, Ill. Various lengths of welding cable or other cables can be assembled without the use of special tools or soldering iron.

The body of the Palmgren connector can be adapted to welding cable in sizes ranging from Nos. 1 to 3/0 inclusive by using the proper size adapter nuts. These cable connectors are interchangeable with the standard solder type Palmgren units.



Westinghouse D.C. Capacitor For Limited Space Application

For high voltage direct current applications where space is limited, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has developed type FPC porcelain-clad inerteen capacitor. From 7,500 volts up to and including the 200,000 volt class, the capacitor elements are hermetically sealed in a tubular, wet process porcelain body with solder sealed end closures. The end closures act as the capacitor terminal by connecting the element leads at opposite ends, utilizing the porcelain tube as insulation.

Larger types of capacitors are furnished with or without cast mounting flanges. Capacitors are solder sealed where castings are used, then the castings are cemented on with mineral-lead compound.

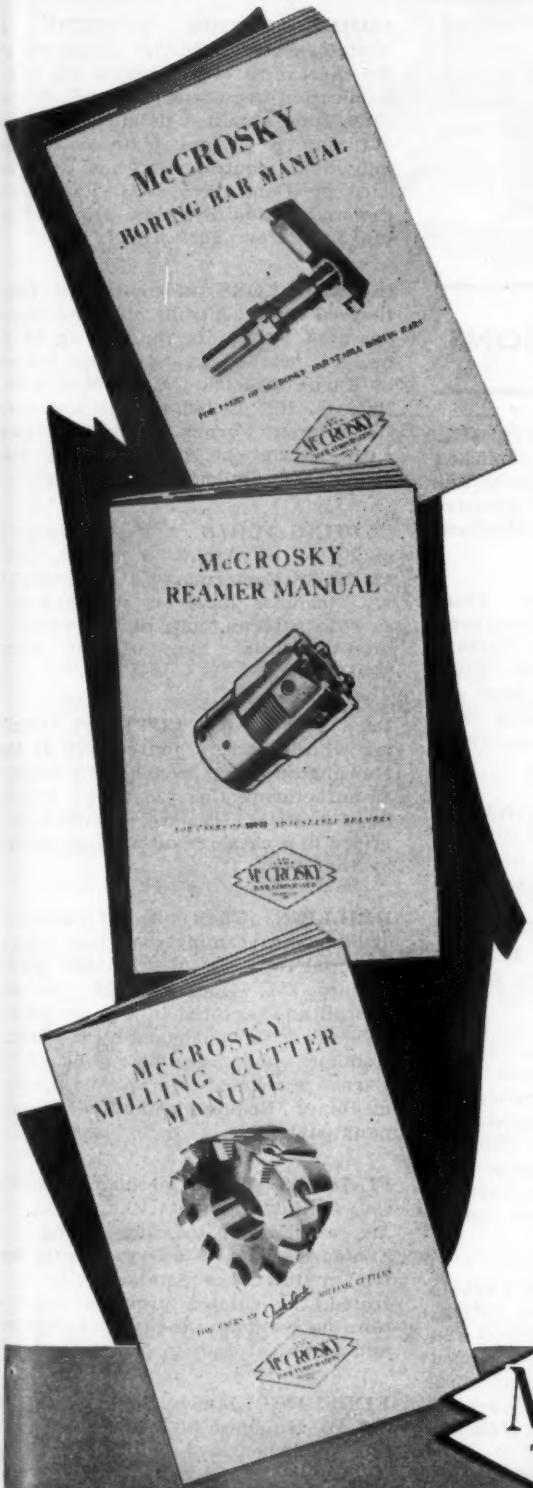
Reynolds Lead-Base Material Bonds at Low Temperature

A method of bonding lead foil or sheet together metallurgically has been developed by Reynolds Metals Co., Foil Div., Richmond, Va. The lead-based material forms a hermetical seal without mounting or heat-seal coating. Temperature of 350 F. melts the surface metal without affecting its lead core.

Dow Translucent Skin Product Protects Parts in Transit

A translucent packaging material which forms a "skin" for protecting machine parts in shipment has been developed by Dow Chemical Co., Midland, Mich. The product has an

How to get longest blade life and shortest down time with McCROSKY INSERTED BLADE CUTTING TOOLS



Practical manuals telling how to get the most from the time and cost-cutting features incorporated in McCrosky tools.

McCrosky Boring Bar Manual gives clear and concise information on the design and use of McCrosky Adjustable Block Boring Bars. The text includes detailed instructions with diagrams on changing blocks in bar, controlling float for finishing cuts, adjusting blades and regrinding, speeds and feeds.

McCrosky Reamer Manual is primarily planned for users of McCrosky SUPER Adjustable Reamers, but it contains helpful information applicable to all types of Reamers. Detailed instructions on adjusting blades, grinds for reaming different types of metals, determining speeds and feeds. Illustrated with diagrams and sketches.

McCrosky Milling Cutter Manual gives detailed instructions on how the blade-locking wedge and the blade-adjusting screw in McCrosky JACK-LOCK Milling Cutters can be used to shorten down time and reduce to a minimum the amount of blade stock sacrificed in regrinding. Other topics applicable to all types of Milling Cutters: mounting of cutters, speeds and feeds, basic grinds, action of cutting fluids, cutter care.

●

SEND FOR *McCrosky Manuals by titles and state your job or department. You will receive promptly the manuals you specify.*

EST 1904
McCROSKY TOOL CORPORATION
MEADVILLE PA

COST CUTTING TOOLS

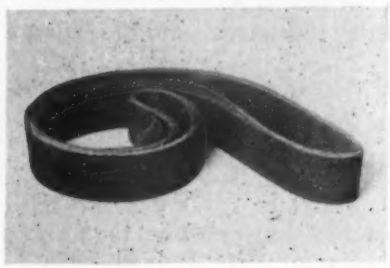
ethylcellulose base and is a plastic-like substance which is applied by a hot dip process. It sets into a tough skin-tight coat in a few seconds, protecting the metal from rust, corrosion and dirt during shipment. It is said to strip off easily by using a pocket knife.

Markal B Paint Stick Marker Developed for Oily Surfaces

A Paintstik marker for icy, wet, sleek or oily metal surfaces has been made available by Markal Co., 6 East Lake St., Chicago, Ill. This marker, designated as Markal B, has been developed especially for outdoor location use. It is furnished in a variety of colors. It has all of the properties of liquid paint, and is said to provide a weatherproof, fadeproof and permanent marking.

Behr-Manning Cloth Belt For Swing Frame Grinders

Heavy-duty Metalite cloth belts, made by Behr-Manning, Div. of Norton Co., Troy, N. Y., are being used on swing frame grinding machines,



instead of solid grinding wheels, for heavy metal grinding operations. An average size belt 4×136 in. provides 544 sq. in. of cutting surface. A wide range of belts is available from coarse heavy-duty for the tough operations through medium weight cloth and paper belts to fine grades.

Lectrofilm Capacitor Material Available in Rolls and Sheets

Lectrofilm, a synthetic dielectric material for capacitors, is being made by General Electric Co., Schenectady, N. Y. It is available in rolls and sheets.

It is said that Lectrofilm's strength and flexibility make this material well suited to automatic methods of manufacture, and that it requires little grading or sorting before being placed into a capacitor production line.

Hydromite Cutting Lubricant Cools and Lubricates Tools

Filmite Oil Corp., Milwaukee, Wis., is offering Hydromite cutting tool lubricant. It is water soluble, transparent and practically colorless. The low viscosity of this product is said to allow it to get to the point of work quickly to lubricate and cool. In use Hydromite is claimed to be smokeless. Being a water solution, this lubricant can be easily removed from the finished work.

Hydromite is said to be a true water solution with extreme, oiliness, high film strength and anti-welding properties. It has no strong odor and is transparent as well as practically colorless in appearance.

TRADE PUBLICATIONS

ABRASIVE WHEELS Felker Mfg. Co., Torrance, Calif., has published a catalog describing its complete line of resinoid bonded diamond abrasive wheels which includes all standard wheel tpyes up to 6 in.

ABRASIVE WHEELS Bay State Abrasive Products Co., Westboro, Mass., has issued a 4-page bulletin presenting facts of its line of "Koolpore" grinding wheels. Included are pictures of various types, along with tool, cutter, and surface recommendations.

ABRASIVE WHEELS AND BANDS The Doall Co., 1210 Thacker St., Des Plaines, Ill., has published illustrated literature on grinding wheels for its surface grinders and other grinders with spindles of 1¼ in. or 3 in. diameters. Other literature describes Doall contour machines in 50, 80 and 150 grits.

BORING AND FACING Included in a 50-page loose-leaf data book, published by W. F. and John Barnes Co., Rockford, Ill., is a section devoted to boring and facing machines. The section, bound separately in paper covers is available to interested persons making request on company letterheads.

CARBIDE TIPPED TOOLS Carbide Fabricators Co., Royal Oak, Mich., offers a plastic-bound catalog and engineering manual of carbide tipped tools. Sections are devoted to standard turning tools, various types of reamers, centers mills and drills.

CLUTCHES The "Maxitorq" floating disk clutch is described in a folder issued by The Carlyle Johnson Machine Co., 52 Main St., Manchester, Conn. Photos and drawings give details of construction. Concise tables present specifications of the clutch.

COLOR BRANDING The Firth-Sterling Steel Co., McKeesport, Pa., which recently announced "Color Branding" of sintered carbide tips, announces the reprinting of the Firthite Color Chart on 8½×11 in. punched sheets suitable for use in engineers' manuals, data books, etc.

COMMUNICATION SYSTEMS A "Catalog-Survey Chart," designed to aid the executive to analyze his communication requirements, and at the same time obtain a detailed proposal outlining a system planned to his individual requirements, has been issued by Department AM, Executone Communication Systems, 415 Lexington Ave., New York 17, N. Y.

CONTROLLERS Information on multi-speed drum controllers for machines operated by motors ranging up to 10 hp., is included in a catalog issued by Furnas Electric Co., 438 McKee St., Batavia, Ill. Listed therein are over 200 different Furnas controllers, along with descriptions, prices, wiring diagrams and dimensional drawings.

CUTTING TOOLS A 15-page catalog published by Archer & Smith, Ltd., 125 North Eastern Ave., Lexington 34, Ky., includes data on standard flat carbide cutting tools, and presents a brief pictorial tour of the company's plant.

DRESSERS AND CUTTERS Grinding wheel dressers and cutters of the Huntington type, produced by Calder Manufacturing Co., 628 North Prince St., Lancaster, Pa., are described and priced in a catalog and a folder issued by that firm.

DRILLING The line of multiple drilling and reaming machines manufactured by the W. F. and John Barnes Co., Rockford, Ill., is described and pictured in a paper-bound catalog section published by that firm. Another, similar section published by Barnes is devoted to deep hole drilling machines. Requests should be on company stationery.

FINISHES The American-Marietta Co., 43 East Ohio St., Chicago 11, Ill. has available a catalog listing the "Valdura" line of heavy duty industrial maintenance paints. Fully illustrated, the catalog provides application suggestions, product descriptions and technical data in complete detail.

FINISHING James H. Rhodes & Co., 157 W. Hubbard St., Chicago 10, Ill., has published a brochure featuring its composite and inter-related line of industrial finishing mediums. Featured are felt wheels and bobs, industrial felts, steel wool, powdered and lump

25 YEARS AGO...

—WE SAID: *"Labor is just as efficient as management plans for it and gives it tools with which to work."*

This is one of the basic principles upon which our business was founded 25 years ago . . . principles which, like the laws of physics do not change.

Evidence that these principles have held through the years . . . that they still continue to operate . . . is found in the fact that our organization has satisfactorily consummated over 6,000 assignments for 500 clients since 1919.

And there is every reason to believe that such principles will just as efficiently apply 25 years hence and far into the future.

Management Engineering has not been successful because of spectacular planning or fly-by-night ideas, but because basic principles have been developed which not only govern labor controls, but inventory and material controls, planning and scheduling controls and all quality controls . . . and then, because these controls have been practically and wisely applied to all production processes.

The notable stepping-up of war production which has resulted from the application of these time-tried controls gives assurance of even greater successes in American production when the war years have passed.

1919-1944

THE TRUNDLE ENGINEERING COMPANY

Brings to Industry

25 Years OF MANAGEMENT ENGINEERING EXPERIENCE

GENERAL OFFICES • CLEVELAND • BULKLEY BLDG.

CHICAGO • City National Bank Bldg. • 208 S. La Salle St.

NEW YORK • Graybar Bldg. • 420 Lexington Ave.

(Advertisement)

Steel Warehouses Meet War Demand for Thousands of Products

It would be difficult to measure even a fraction of the man-hours gained each week through prompt delivery of steel in small quantities from local warehouse stocks. This service of the nation's steel warehouses has been handled so smoothly that the work, though highly essential, is virtually taken for granted.

The saving of precious time when repairs can be made promptly . . . when production lines can be kept running . . . when design can be changed quickly to meet urgent needs . . . or when construction can be completed quickly makes each warehouse shipment a vital service. Joseph T. Ryerson & Son, Inc., have long held an enviable reputation for leadership in this field. They have been serving the needs of the nation for over a century. When you need steel, make Ryerson your number one source. Ten convenient Ryerson plants are ready with large stocks and with every facility for serving you promptly.—*(See Advertisement)*.

Steel for weapons—for essential industries—steels for maintenance—special aircraft steels and NE alloys—all are immediately available in Ryerson stocks! When shortages occur, Ryerson technical experience finds an alternative. When speed is paramount, Ryerson operating men make delivery on time. Call Ryerson first, whatever your steel requirements, for prompt, effective cooperation! Joseph T. Ryerson & Son, Inc.; Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE

pumice, abrasives and rouges and sponges and chamois.

GAGES Pamphlets issued by Metrical Laboratories, Inc., 417 Detroit St., Ann Arbor, Mich., describe its line of "Metricator" air operated precision gages and indicating plugs.

GEAR MOTORS Bulletin No. 3100 of The Falk Corp., 3001 W. Canal St., Milwaukee, Wis., is devoted to the selection of the correct gear motor units for specific applications. Methods of selection, selection tables and complete dimensions for every size and type of unit are included. Copies are avilable to those requesting them on company stationery.

GRINDING The uses of "Metalite" cloth belts in swing frame grinding is described in a folder issued by Behr-Manning, Division of Norton Co., Troy, N. Y.

HACK SAW BLADES Victor Saw Works, Inc., Middletown, N. Y., has prepared catalog 43-V, a combination technical instruction book and sales manual for the company's entire line of standard steel hack saw blades.

HEAT CONTROL Wheelco Instruments Co., Harrison and Peoria Sts., Chicago 7, Ill., has issued bulletin A2-3, describing the potentiometer method of heat measurement, and explaining the electronic principle employed in its "Potentiotrols" to gain instant control in line with the temperatures recorded. Included is a list of instrument features, four operating diagrams, and a table of potentiotrol scale ranges obtainable with various thermocouples and a photoelectric pickup unit.

HEAT TREATING Surface Combustion, Toledo, Ohio, has produced a pocket-size booklet "for those who have only recently experienced the essentiality of heat treating, and for those who have the tremendous job of converting war production lines to produce for peace."

HYDRAULICS An 18-page section of a new catalog dealing with many phases of hydraulics as applied to machine tools and aviation, has been released by Hydraulic Machinery, Inc., 12825 Ford Rd., Dearborn, Mich.

HYDRAULIC UNITS A catalog section bound in paper covers and devoted to hydraulic units and their application to various types of machines, is available to those writing W. F. and John Barnes Co., Rockford, Ill., on business stationery.

IDLER Mattison Machine Works, Rockford, Ill., has prepared a folder describing and picturing uses of its No. 135 backstand idler, through use of which "present grinding and polishing lathes can be adapted to use of factory-coated abrasive belts."

2 HIGHER PRODUCTION RATES

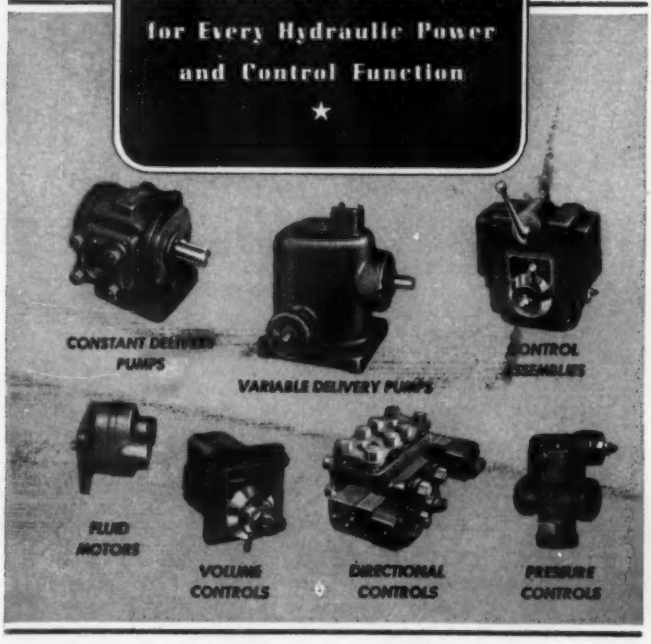
In the postwar period the manufacturer will face two demands that are difficult to reconcile: (1) his customers will want products of highest possible quality at lowest possible cost, and (2) labor will exert every effort to maintain highest hourly wage rates. Without higher machine production rates, such demands are obviously impossible. Inevitably the manufacturer must have machines which will produce more and better products with fewer man hours and machine hours per unit.

Vickers Hydromotive Controls are solving this problem for machinery builders in many industries. For example, completely automatic operating cycles are easily obtainable with Vickers Hydraulic Equipment... much of the required skill can be built into the machine. Flexibility in hydraulic control systems frequently permits time saving by traverse and return at higher speeds. Overload protection can be positive and automatic. Controls are simple and easily operated; they can be so interlocked that neither the work nor the machine can be damaged by the inexperienced or careless operator.

Vickers Application Engineers will be glad to discuss with you the higher production rates and the many other advantages of Vickers Hydromotive Controls.

What will Users Want in POSTWAR MACHINERY?

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function ★



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A STEEL KNOT
ACTUAL PHOTOGRAPH
Speed Treat Steel (.45 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.
SPEED TREAT STEEL
A MEDIUM HIGH CARBON OPEN HEARTH PRODUCT
ONE STEEL that gives you
1 Excellent machinability
2 Greatly extended tool life
3 Good finished parts
4 High physical properties
5 Excellent impact resistance
6 Good torsional values
7 Minimum distortion
8 Fine heat treatability
SPEED TREAT STEEL—Use this ONE steel in place of the several comparable steels you are now using. You'll save time, tool life and money per ton used. Machinability is 170 S.F.P.M. PLUS excellent impact resistance, torsional values, minimum distortion and heat treatability. ★ WRITE US FOR DETAILS... OUR METALLURGISTS ARE AT YOUR SERVICE
BUY WAR BONDS
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MONARCH STEEL COMPANY
HAMMOND • INDIANAPOLIS • CHICAGO
PECKOVER'S LTD., Toronto, Canadian Distributor
MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

INCHING CONTROL Publication 170 of the Electric Machinery Mfg. Co., 1331 Tyler St., N. E., Minneapolis, Minn., describes that firm's apparatus for spotting, or slowly rotating a 3-phase synchronous motor or slip-ring induction motor.

INFRA-RED Section No. 3 of its Encyclopedia of Near Infra-Red has been made available to industry by The Fostoria Pressed Steel Corp., Fostoria, Ohio. Described and pictured therein are typical applications of infra-red in the manufacture and repair of plywood planes.

LUBRICATION A chart designating the correct "Fortified" lubricant for use in various types of machinery is available from E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33, Pa.

MANGANESE STEEL Bulletin 943-R of the American Brake Shoe Co., American Manganese Steel Div., Chicago Heights, Ill., describes the uses of manganese steel by railroads and in excavating equipment.

MATERIALS HANDLING The Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa., has published a booklet devoted to "Modern Materials Handling Machinery Applied to American Industry." It contains information pertaining to recommended handling practice with that firm's type of handling machines and also illustrations of many applications.

MILLING The use of the No. 1 hydraulic "Rigidmil," manufactured by Sundstrand Machine Tool Co., 2531 Eleventh St., Rockford, Ill., for milling small parts, is described in bulletin No. 1-1 published by that firm. Photographs and drawings show applications and details of the machine.

MILLING The milling machines manufactured by W. F. and John Barnes Co., Rockford, Ill., are presented in photographs and drawings appearing in a paper-bound catalog section available to persons making requests on their organization letterheads.

PLANERS A broadside prepared by The Cincinnati Planer Co., Cincinnati 9, Ohio, describes "The Cincinnati Hypro Line for planing, boring, turning and milling." It specifically sets forth the use of these machines "For greater production in railroad shops."

POSITIONERS Various types of special welding positioners built by Quickwork Div., Whiting Corp., Harvey, Ill., are illustrated in a folder available from that company.

POWDER METALLURGY A booklet prepared by Keystone Carbon Co., Inc., Saint Marys, Pa., sets forth briefly the facts and advantages of powder metal-

lurgy, gives example of successful applications and presents information of value to designers of powdered metal parts. The text is supported with many photographs, drawings and charts. A second section deals with "Selflube" porous bearnigs.

PRESSES The Watson-Stillman Co., Roselle, N. J., has issued bulletin No. 320-A, covering its line of straightening and bending presses. Included therein are 38 pages of descriptive matter, illustrations and tables of work capacities, augmented by engineering tables and other technical data.

PUNCHING Types AA, C, CA, and Z hole punching units, manufactured by Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y., are described in Catalog C, just published by that company. Colored pictures, engineering drawings, text and tabular information give details of the units.

RIVET HANDLING Bulletin No. 89 of The Cleveland Pneumatic Tool Co., 3781 East 77 St., Cleveland 5, Ohio, describes and pictures the improved "Cleco Riv-N-Jector," designed for more expeditious and economical handling of rivets.

SAFETY To further the campaign against industrial eye accidents, American Optical Co., Southbridge, Mass., is making available: safety posters; "The Safety Clipper," a clip sheet for use by house organs; recommendations for effective eye protection programs; and a 16 mm. sound training film demonstrating the fitting of non-prescription safety goggles, and a booklet carrying the same information.

SAWS A packet of illustrated literature describing: steel ink for precise layout work, checking and locating high spots; soluble oil, a lubricant and coolant; cutting oils and "Saw EEZ," a sawing lubricant, is available from The Doall Co., 1210 Thacker St., Des Plaines, Ill.

SCALES Detecto Scales, Inc., 1 Main St., Brooklyn, N. Y., has issued a broadside picturing and describing its line of precision scales, designed to meet specific requirements of various types of industry.

SURFACE PLATES A folder of the Barco Scraping Co., 1975 East 65 St., Cleveland 3, Ohio, describes its line of surface plates, angle irons and straight edges, along with pictures of each style.

TAPS AND DIES A combination catalog and handbook issued by Winter Bros. Co., Wrentham, Mass., covers the various taps and dies of its manufacture and a section on tapped hole sizes, together with useful infor-

TURNER PLAST-O-LOCK GAUGE SAYS STOP on its NOT GO member!

(Patent Applied For)

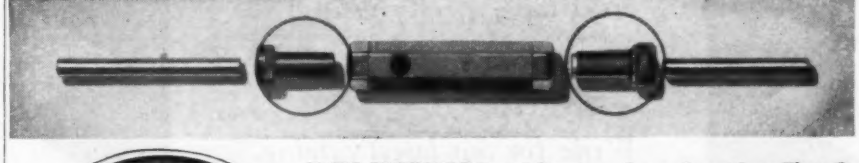
Here's another first by Turner—a *red* plastic collet to more quickly identify the "not go" member of your plug gauges! Plast-O-Lock gauges are great time savers wherever they are used.

Turner's Plast-O-Lock (patent applied for) collet type plug gauges are not only easier to use but they will multiply the life of plug gauges many times. The reason for this is obvious. Because Plast-O-Lock features a collet of plastic, slotted and tapered to fit into the tapered end of a standard plastic handle, it is possible for the gauges to be held securely without their surfaces being scratched or burred, thereby allowing use of most of the gauge's length. For example, as the "go" and "not go" ends are worn beyond allowed tolerances they are simply cut off, thus leaving an unused end ready for gauging. To illustrate further, if a boring no deeper than ⅛" is being checked, as many as 8 fresh gauging sections may be obtained from one standard length "go" gauge as furnished with Turner's Plast-O-Lock. This obviously eliminates the necessity of salvaging used gauges.

For full particulars about Plast-O-Lock gauges wire or write us today.

★ *Features* ★

1. Multiplies the life of the plug gage.
2. Collet will not mar a lapped or polished surface.
3. Used with plastic handle the gauge has a more sensitive feel in the hands of an inspector.
4. Is easy to make length adjustment because slot is provided for end wrench.
5. Plast-O-Lock size range from .050 to .690.
6. Red plastic collet for quick identification of "not go" members.



TURNER BROTHERS

DELIVERY Fast delivery can be made on these Plast-O-Lock gauges as well as the following Turner gauges: ring, flush pin, snap and built up.

TURNER GAUGE GRINDING COMPANY
2625 HILTON ROAD • • • • FERNDALE, MICH.

Sizes AVAILABLE

Plug Size Range	Length of "Go" Gauge	Length of "No Go" Gauge
.050 to .099	1⅞	1⅜
.100 to .149	2	1½
.150 to .199	2¼	1¾
.200 to .249	2½	2
.250 to .499	3	2
.500 to .690	3½	2½

HOW TO ORDER PLAST-O-LOCK

1. Diameter.
2. Length of gauging surfaces.
3. Tolerance or accuracy.
4. Hardened alloy steel or chrome, tungsten carbide or Nor-Bide.
5. Number of members—Go, Not Go, Handles.
6. Complete marking instructions.

WOOD
Woody Spencer says:
"We are maintaining the standards of quality and precision that have established WOOD & SPENCER as a leader in the manufacture of fine taps. When next you order taps, specify WOOD & SPENCER.
Write for our latest catalog."
The Wood & Spencer Company
Cleveland 3, Ohio

mation and the tables adopted by the Institute of Tap and Die Manufacturers. Requests should be on company letterheads.

TAPPING "Facts About Precision Tapping" is the title and subject of a pamphlet issued by Bakewell Mfg. Co., 2023 Santa Fe Ave., Los Angeles 21, Calif. Answered therein are the questions, "What are precision cut threads?," "What are the advantages of precision cut threads?," and "How are machine screw threads cut to these strict specifications?" Explained is the Bakewell method of tap control. Bakewell has also issued an envelope stuffer picturing and describing its line of precision tapping machines.

TORCH BRAZING An instruction sheet for torch brazing with silver alloys is available from Handy & Harman, 82 Fulton St., New York 7, N. Y., both in 8½×11 in. size and as a wall chart.

TRIMMER The Quickwork Div., Whiting Corp., Harvey, Ill., announces publication of bulletin #QW-115 describing its improved type of stamping trimmer.

TUNGSTEN ELECTRODES Bulletin No. 154, issued by Callite Tungsten Corp., 540-39 St., Union City, N. J., describes the application of its line of Tungsten electrodes by atomic-hydrogen, helium and argon arc welding and gives data on electrodes available.

WELDING Allegheny Ludlum Steel Co., 2319 Oliver Bldg., Pittsburgh 22, Pa., has issued a 64-page bulletin describing various methods for welding stainless steel and telling how these methods differ from those used for welding carbon steel.

WELDING A service of design plates for arc welding is available from Hobert Brothers, Hobart Square, Troy, Ohio. Consisting of a series of loose-leaf plates, issued from time to time, it is designed to serve as a supplement to the company's previously published handbook, "Practical Arc Welding."

SIXTY YEARS AGO

(From Dec. 29, 1883 and Jan. 5, 1884 Issues of AMERICAN MACHINIST)

Scotch Absenteeism

A report comes from Glasgow, Scotland, that Clyde ship building and machine trade are losing orders through the habit of a great many of the mechanics remaining out on drunken bouts for two or three days each week. It has become so serious as to interfere with the regularity of builders in finishing orders, and several cases have recently happened of

work going to continental firms because those of the Clyde could not be relied upon to finish the contracts on time. Drunkenness receives too much apology in all quarters of the British Isles. The fashion in this country of discharging men who display greater attention to whisky than to their work is better for all concerned.

Underground Currents

Professor Henry Morton, president, Stevens Institute of Technology, holds that it is impracticable to put electric light wires underground, and that the dangers to life and property from aerial wires have been greatly exaggerated. He believes that carrying wires underground would increase their danger, since they would have to be brought above ground to the place used. In European cities where the underground plan has been tried, the expense of keeping up the system became so great that the electric lighting was virtually abandoned. He predicted that should an order be carried out here to place the electric wires underground the streets of New York will return to the pristine gloom which has overtaken Paris.

Indoor Sport

The troubles with the grip on the Brooklyn Bridge trolley line are already bearing fruit in the Patent Office records. Every week brings forth one or more patent grips and the backwoods are not yet heard from. Should the winter prove severe enough to suspend out-door labor in the rural districts, the spring will usher in an array of patent grips that will leave car couplers, electric lamps, and check rowers entirely in the background. When anything happens to keep a portion of our population inside doors its effects are immediately apparent in the Patent Office records.

The Machine Tool Surplus

BY FRED COLVIN

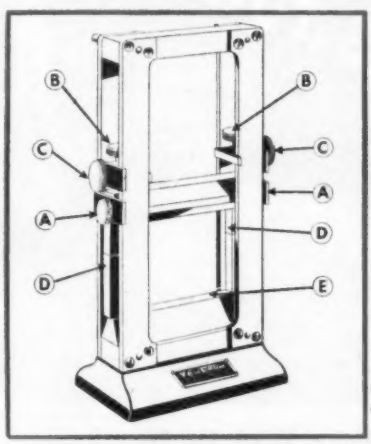
Although the disposition of machine tools no longer needed after the war is now being discussed, attendant problems should not be considered solely from their effect on any one industry or group, but on a national and international basis. After all, this war should have taught us that future prosperity, or even safety, does not lie solely within our own borders, when oceans are no longer a safeguard against bombardment and invasion.

When present hostilities cease, it would be well for us to avoid abandoning munitions and similar plants, as we did after the last war. This could only be done when the leading world governments give evidence of sufficient desire for world peace to give careful consideration to the effect of their legislation upon other countries, to prevent a recurrence of post-

SET YOUR INTERNAL INDICATOR THE ELLSTROM WAY . . .

it's quicker and more accurate

This Internal Setting Gage (Patents applied for) was designed by Elmer Ellstrom of the Dearborn Gage Company to eliminate the old-fashioned time-wasting method of setting instrument and gages by using clamps and parallels with gage blocks. Its gaging surfaces are processed and finished to millionths in flatness, thereby making possible the ultimate in checking with the minimum of adjustments. For example if the gage is adjusted for 2″ reading and a 1.875″ reading is desired it isn't necessary to make a readjustment; all that is required is to wring a .125 gage block on the bottom surface of the gage, immediately giving a 1.875″ check. Wire or write for prices today.



IT IS EASY TO ADJUST

To adjust the Ellstrom gage you merely follow the instructions listed below:

The two screws, A, on upper parallel bar have been carefully adjusted and need not be touched. In raising or lowering the bar loosen only screws C, then place fingers on screws A, and move bar upward or downward as the case may be, but without turning the screws.

Allow room to place the gage blocks on lower parallel between the posts of the gage. Then lower bar until its surfaces and those of the blocks fit snugly without any forcing. Tighten Screw C lightly and evenly. Screws B are then used to apply slight pressure in making final adjustment.

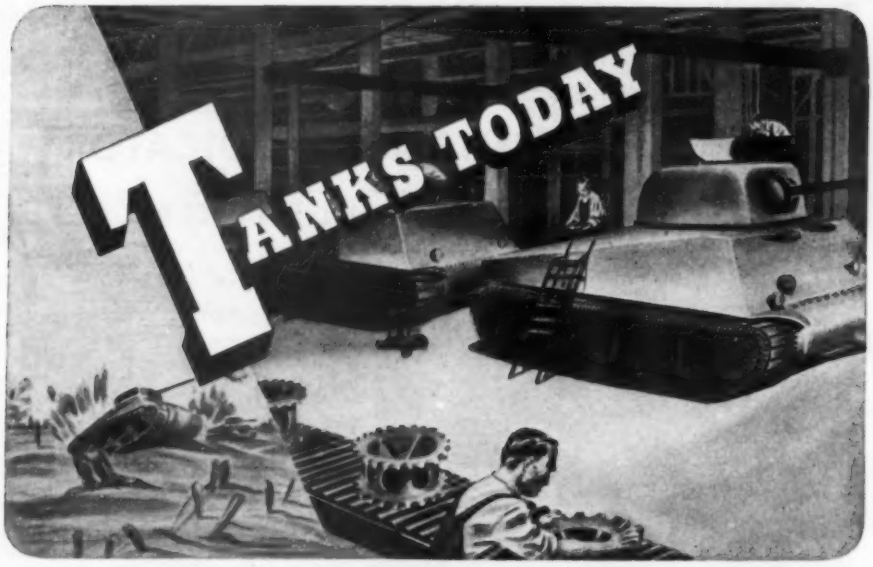
A film of rust-proof oil has been applied to the entire gage, and can be removed with a clean cloth or if necessary a little naphtha. D gage blocks E stationary parallel.

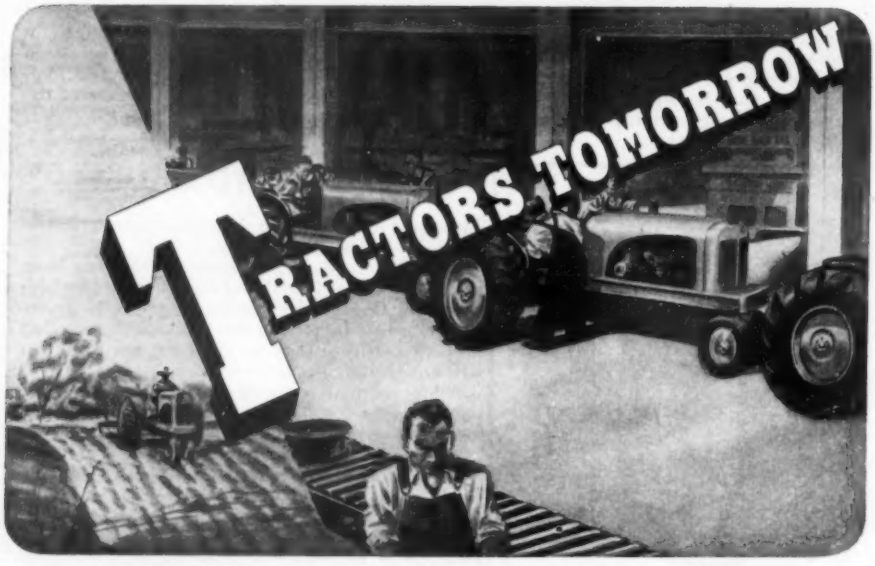
DEARBORN GAGE CO. 22038 BEECH STREET DETROIT, MICHIGAN

Originators of Chromium Plated Gage Blocks

THERE IS A DEARBORN REPRESENTATIVE IN THE FOLLOWING CITIES . . .

Mr. H. S. Kartsher, Cleveland Heights 6, Ohio
Sterling Products Co., Inc., Chicago 6, Illinois
Mr. Harley E. York, Dayton 3, Ohio
Machinist's Tool & Supply Co., Los Angeles 11, California
Mr. C. W. Moore, Atlanta, Georgia
Mr. Joseph C. Fletcher, San Francisco 3, California
Richard Ives Company, Denver, Colorado
Merrick Evans Company, Fort Wayne, Indiana
Clutsom Machines, Incorporated, New York 17, New York
J. R. Stewart & Associates, Syracuse 2, New York
Mr. W. H. Scheer, St. Louis 17, Missouri
General Tool Sales Company, Philadelphia 40, Pennsylvania
James T. Donnolly Co., Ltd., Toronto, Ontario, Canada
Winn Engineering Sales Co., Minneapolis, Minnesota
International Machinery Co., Hamilton, Ontario, Canada
Oliver Van Horn Company, Houston 1, Texas
Mechanical Engineering Service, Seattle, Washington





- - Standard Conveyor Engineers Will Be Ready —With Added "Know-How" to Their 35-Year Experience Record—For Conveyor Jobs to Come

The experience record of the Standard Conveyor organization spans a period which includes two world wars.

For more than 35 years Standard Conveyor Company has concentrated on power and gravity conveyors. Such specialization has developed improved design and materials in the conveyors themselves and given Standard Conveyor engineers an invaluable reservoir of practical experience.

Knowing how to apply power and gravity conveyors to best advantage is equally as important as building them well. Its service record with American business and industry attests Standard Conveyor Company's ability to do both.

Write for valuable reference book, "Conveyors by Standard" Catalog AM-7

STANDARD CONVEYOR COMPANY
General Offices: NORTH ST. PAUL, MINNESOTA
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★ ENGINEERED FOR FASTER PRODUCTION ★

World War I legislation which laid the foundation for the present war.

Probably plans presented for disposal of surplus machinery will include advocating destruction of such machines or giving them away to devastated countries. Neither plan should be considered.

It would be more advisable to rebuild the general-purpose machines, although most special machinery might have to be scrapped. Many American shops with good experience in utilizing second-hand machines for war purposes could use some more such equipment after the war at a fair price. Moreover, shops in devastated areas of Europe or Asia and South American shops desirous of increasing their capacity would find such machines a real asset if available on fair terms. Foreign sales of these types probably could not be made for cash, but could be bartered for raw materials or other products.

Contrary to some opinion, such rebuilt machines would not become direct competitors of first-grade equipment used in American mass-production plants, but would be far better suited to the production needs of foreign countries than new, especially built machines. If secured at a low capital investment, they will enable those countries to improve their industrial status and more quickly assume normal, pre-war prosperity.

Must Rebuild Thoroughly

But to avoid bad reactions abroad, such reconditioning must be honest. When I was in China some years ago I found that only new machines would be considered by Chinese shop owners, because they had been "stung" so often by unscrupulous misrepresentations as to the condition of second-hand machines which proved to be worthless although guaranteed in perfect condition. After the war, China can use thousands of machine tools, but unless we can offer satisfactorily rebuilt machines at a low price, they may buy new machines from other countries at lower prices than from the United States.

The proposal that machine tool builders recondition their own machines seems like a good way of taking up the slack following cessation of war orders. Such rebuilding might be financed by a central agency, which would then hold the machines for later use. Such an agency could also control exports. This procedure is being followed by other machine building nations and would put American builders on a par with them.

Whatever plan is adopted should be the result of careful, unbiased consideration by both the machine tool industry and those responsible for international policies. Political bias and past practice should have no consideration in such plans. Unless the matter is handled with the welfare of the whole country in mind, rather than that of any special group, it will react unfavorably to all concerned.

A DOW MAGNESIUM SERVICE—

PERMANENT MOLD CASTINGS, COMBINING ECONOMY WITH SURFACE SMOOTHNESS AND CLOSE DIMENSIONAL TOLERANCES

● A modern permanent-mold foundry is an important unit of Dow's complete fabrication facilities for supplying you with Dowmetal Magnesium Alloys in all fabricated forms.

Complete production equipment, combined with laboratories for X-ray and metallurgical control, make Dow a preferred source for sound and accurate permanent mold castings.

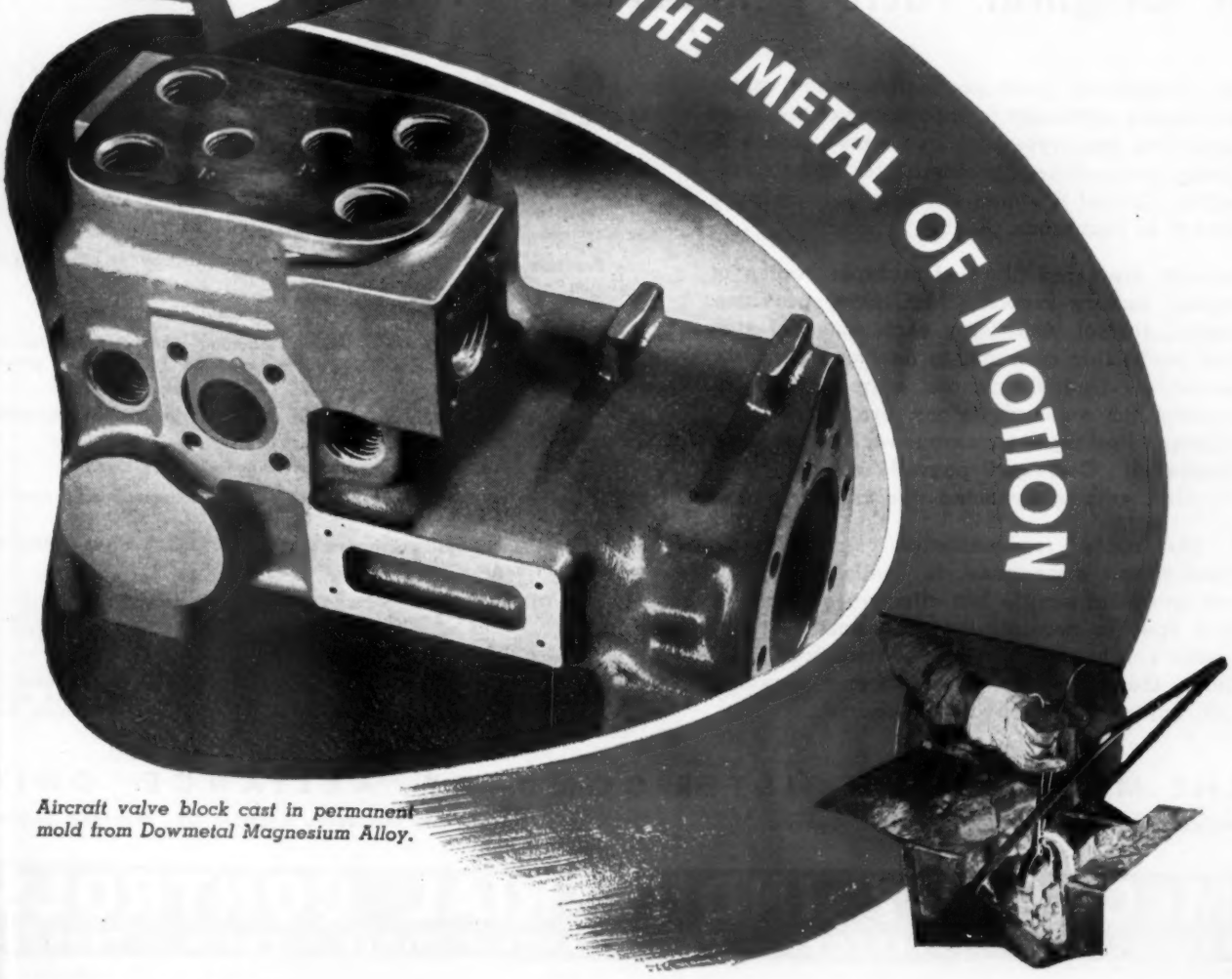
Dow's intimate technical knowledge, gained through long experience, places it in a strong position to produce magnesium products in this and all other forms of fabrication. Consult Dow as the recognized source of information on the fabrication and uses of Magnesium —the Metal of Motion.

MAGNESIUM DIVISION
THE DOW CHEMICAL COMPANY
MIDLAND MICHIGAN

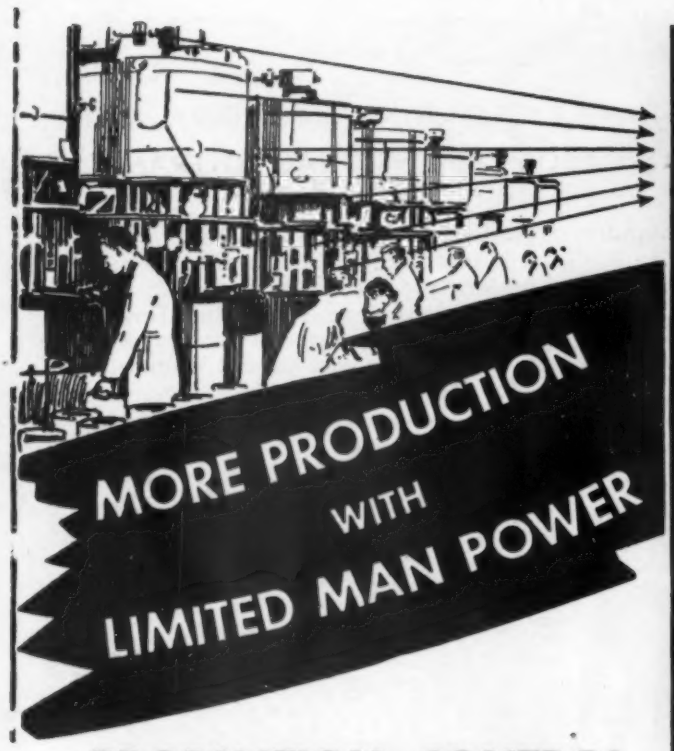
New York, Boston, Philadelphia, Washington, Cleveland, Chicago, St. Louis, Houston, San Francisco, Los Angeles, Seattle

DOWMETAL *magnesium products*

THE METAL OF MOTION



Aircraft valve block cast in permanent mold from Dowmetal Magnesium Alloy.



PRODUCTION CONTROL with Minimum Clerical Work Through Visible Filing of Original Factory Records . . . . . .

The demand for peak production when selective service continues to take many of the most productive employees for our armed forces is a tough management problem. McCaskey Production Control Systems can help—are helping solve it in numerous plants.

Through the rapid filing of multiple copies of original factory records, McCaskey provides graphic control visualizing each essential step from production planning to final operations or assembly. Up-to-the-minute supporting data, essential for quick decisions, are available at a glance. Posting of numerous records is totally eliminated. Cost and payroll data also are provided without repeated clerical operations.

A McCaskey representative, qualified by training and experience, is available to help you work out simple but effective controls for your specific requirements—controls that will enable you to step up and maintain production under the handicap of manpower shortage. Call him in. No obligation, of course.

TYPICAL NEEDS SATISFIED BY McCASKEY PRODUCTION CONTROL

. . . Flow of finished parts coordinated to avoid either excessive or unbalanced inventories or assembly delays resulting from missing parts.

. . . Work-in-process quickly and accurately available from original records in central control.

. . . Progress record showing immediate status of any or all orders at a glance . . . Forecast of product delivery.

. . . Overdue orders eliminated or under control.

. . . Machine scheduling, departmental machine loads and job assignment to keep all machines busy all the time and run jobs in proper sequence.

. . . Check of machine production to assure realization of production standards.

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. . . Tool crib control providing more production with less tools.

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Although the specific needs of plants and departments differ, the flexibility of McCaskey Production Control makes it readily adaptable to the severe conditions existing today. You name yours and McCaskey will satisfy them.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

The Kellogg Division

of

American Brake Shoe Company

announces the purchase of

Crown Spray Gun Manufacturing Company

Kellogg Division of American Brake Shoe Company has acquired the Crown Spray Gun Manufacturing Company of Los Angeles, California.

This adds to the Kellogg-American line of air compressors a complete range of spray equipment including guns, booths, exhaust fans and paint containers.

Kellogg also makes car lifts and high-speed car washers. With the purchase of Crown's production and research facilities, service in the fields where Kellogg-American is widely known and used will be expanded.

Products of the Crown plant, which will continue to be made at Los Angeles, will be distributed in the future under the name Kellogg-Crown. Each plant will benefit from the research and engineering divisions of both organizations, and from that of the American Brake Shoe group of technologists at Mahwah, New Jersey.

Kellogg Crown products and parts are available at

Crown Spray Gun Manufacturing Company, Los Angeles, California
Kellogg Division, Rochester, New York

AMERICAN **Brake Shoe** COMPANY

AMERICAN BRAKE SHOE COMPANY, 230 PARK AVE., NEW YORK 17, N. Y.

8 DIVISIONS, 59 PLANTS SERVING INDUSTRY AND TRANSPORTATION

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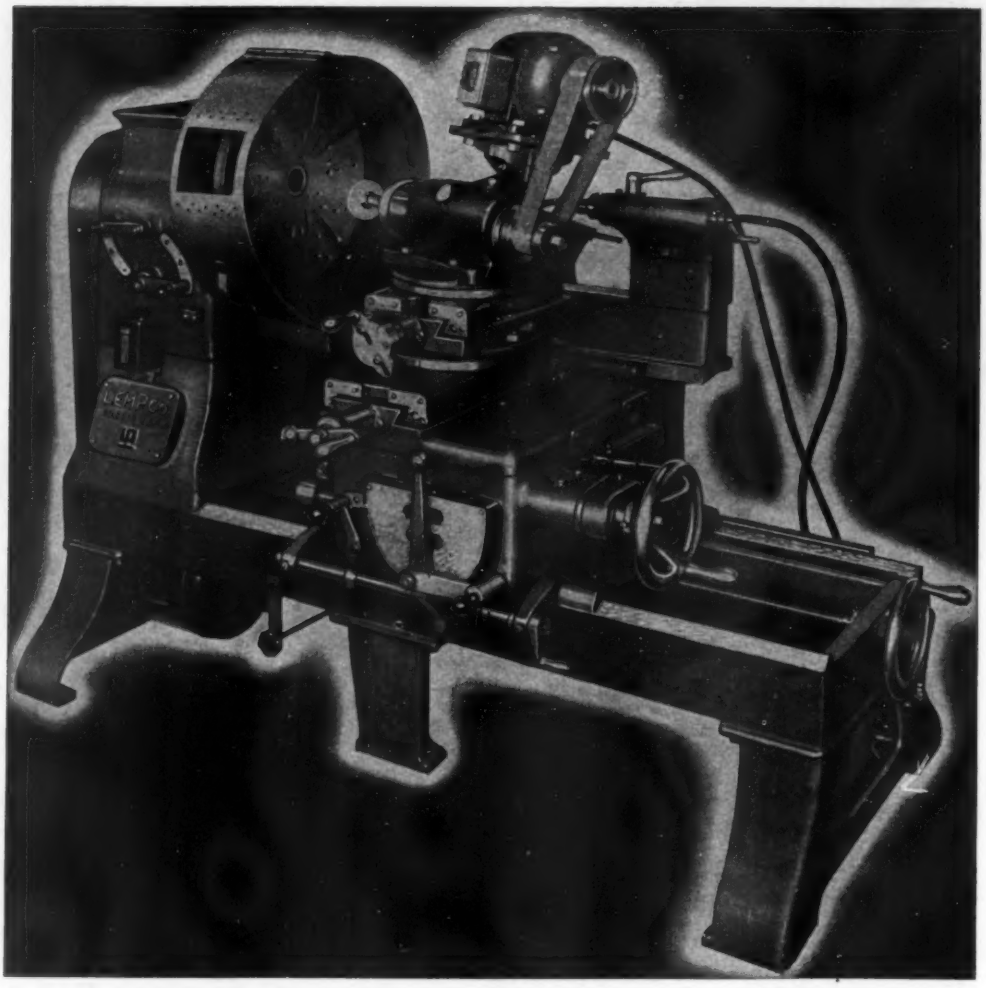

MORE THUNDERBOLTS ROAR BECAUSE THE LEMPCO MODEL HGX FINISH GRINDS THEIR TAILFORKS FASTER!

The big 53" swing on the new Lempco Heavy-Duty Universal Grinder is just what the doctor ordered for grinding these fighter craft tailforks. Only one set-up required to finish both bearing lands on this difficult to handle odd-shaped one-piece forging. Turns and grinds, internal, external, face and taper jobs! 3 Quick-change speeds for both cross-feed and table feed. 360° Compound. Automatic trips and feeds insure skilled work — even from apprentices.

THUNDERBOLT TAILFORKS . . .

Three types pictured above are all ground to .0002" tolerance fast, accurately, and easily on the new Lempco Model HGX.

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MODEL HGX GRINDERS

$3750

GOOD DELIVERY

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WRITE FOR DETAILED CIRCULAR

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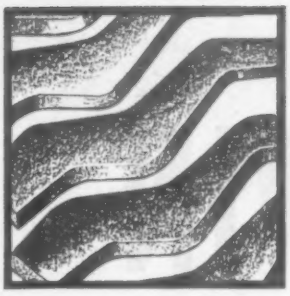
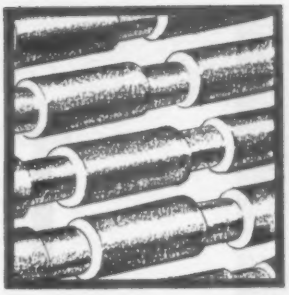
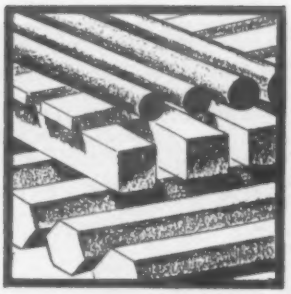
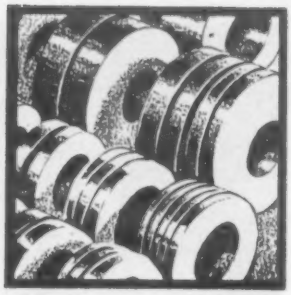
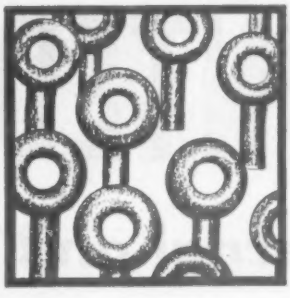
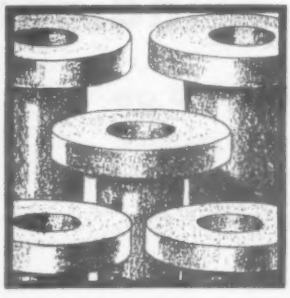
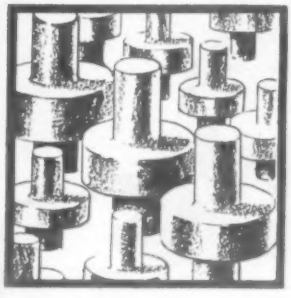
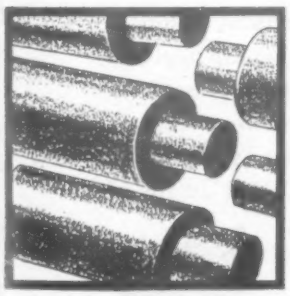

Do You Need Hammer Forgings or Upset Forgings?

Capacity is now available at Kropp Forge for hammer (flat die) forgings—large or small, singly or in any quantity; also for upset forgings up to 5" in size. The completion of part of our war assignment has released these facilities for those with adequate priority ratings.

If you need forged bars, blanks, rings, axles or other hammer-forged parts—or upset forgings—Kropp is prepared to start production on your order as soon as the steel is available.

Call the nearest Kropp engineering representative, or send your blue prints with complete details direct for immediate quotation.

(Our drop forging capacity is still completely scheduled for some months in advance on essential war orders.)

KROPP FORGE COMPANY

5301 W. Roosevelt Road

Chicago, Ill.

Makers of Drop, Upset and Hammer Forgings
"World's Largest Job Forging Shop"

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Denver	Cleveland	Montreal
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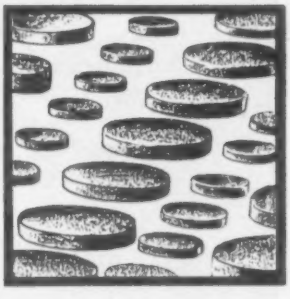
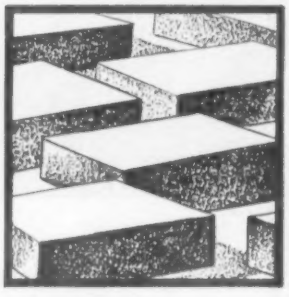
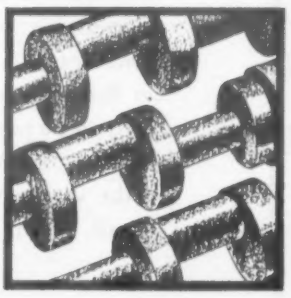
Atlanta	Hartford, Conn.	Vancouver



KROPP

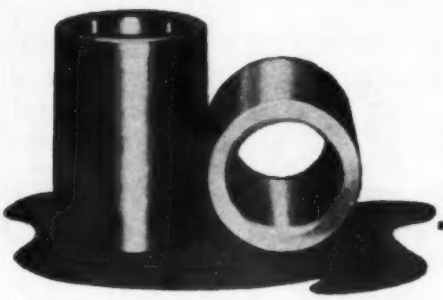
SERVING INDUSTRY SINCE 18 31 OVER 100 YEARS — K — KROPP FORGE CO.

ARMY E NAVY

TWIN MOUNTED

for external and internal grinding!

Two DUMORES on one set-up assure concentricity and cut handling time.



The job illustrated is a sleeve bushing, both internal and external diameters to be ground, concentricity to be held within .0005 inch. Two Dumore Precision Grinders mounted on the base enabled both grinding operations to be performed at one chucking. This method makes concentricity easy to obtain, at the same time cuts handling time almost in half. This is one of the numerous ingenious arrangements of Dumore Precision Grinders which are facilitating war production in plants throughout the country . . . examples of the remarkable adaptability of Dumore Grinders to a wide variety of production applications.

For helpful suggestions and full details of all models, ask for Catalog 42.

The Dumore Company, Grinder Division, Racine, Wisconsin

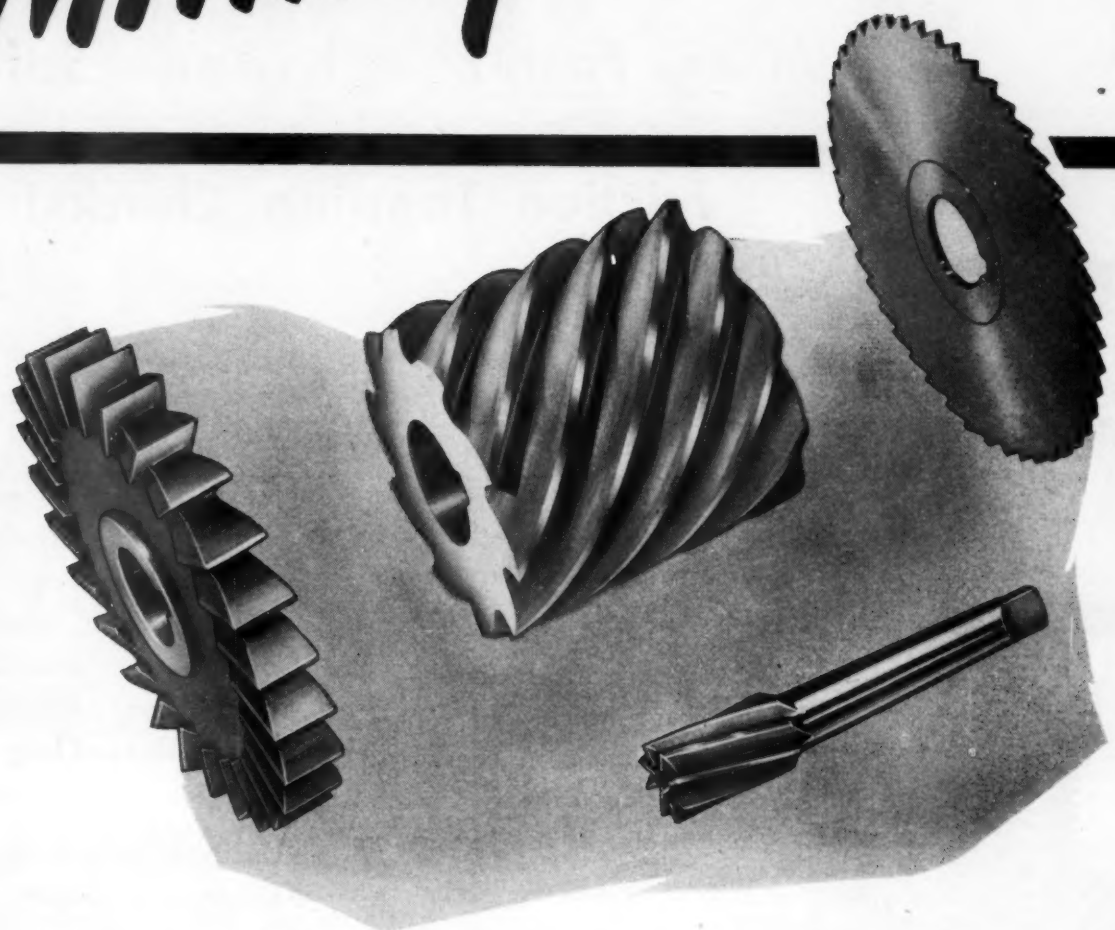
Dumore

PRECISION and Off-Hand GRINDERS

DUMORE GRINDERS ARE SOLD BY AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL CITIES

GORHAM STANDARD

Milling Cutters



Standard cutters and tool bits carried in stock ready for immediate shipment • Special tools made to your specifications and requirements • Catalog will be sent on request

GORHAM TOOL CO.

14400 WOODROW WILSON • DETROIT 3, MICHIGAN

Green Help produces

More, Faster with Apex Safety

Friction Tapping Chucks!

Even inexperienced operators work *faster* and *better* with Apex Safety Friction Tapping Chucks.

These chucks minimize tool breakage because they practically eliminate the hazard of overloading. Taps work safely, accurately, at top speeds on through or bottom holes.

Chucks are easily adjusted for different sizes of taps and, once adjusted, maintain proper tension over long periods. End thrust set up by tapping or pressure exerted by operator on spindle does not affect friction setting. Multiple friction discs have large area and long service life.

Use these chucks on reversible drill presses, radials, handscrews, etc., and save cutting tools. Catalog No. 14 on request.

APEX

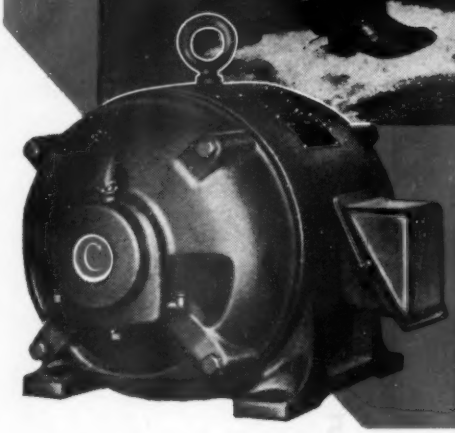
THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

Take a Look at TOMORROW— *Today!*

"That's certainly a good looking motor—and well protected against anything that might fall on it."

"Yes, and that's not all. Its smooth operation helps to maintain the accuracy of this shaper."



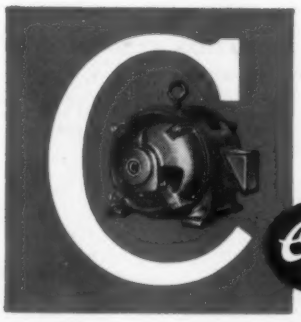
The *Extra Protection* of CENTURY FORM J MOTORS Means Long, Uninterrupted Production Life

Inside and out, the Century Form J Motor has many features that contribute to longer motor life and more accurate performance of the driven machine. The upper half of the motor is closed—protecting it against falling solids and dripping liquids—helps keep out dirt, chips, cutting oils, tools, etc. Its smooth, well-proportioned contours make it easy to keep clean, as well as easy to look at.

The Century Form J Motor is unusually free from vibration, which is important to quietness, accuracy, and precision of the machine on which it is mounted. This lack of vibration is due to many design features which include: mechanical and electrical balance, rugged cast frames, extreme rigidity, accurately machined feet. A very effective ventilation system keeps the bearings and windings cool — adds extra life.

The Form J Motor is only one of a wide range of motor types and sizes, from fractional to 600 horsepower, available from Century.

Today—and tomorrow, it will pay you to remember Century Motors for all your electric motor requirements.



CENTURY ELECTRIC CO.
1806 Pine Street St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

© Century Electric Company, 1944.

352

10 parts of wear-resisting Ampco Metal on the Lodge & Shipley Duomatic ... to guard against costly failures

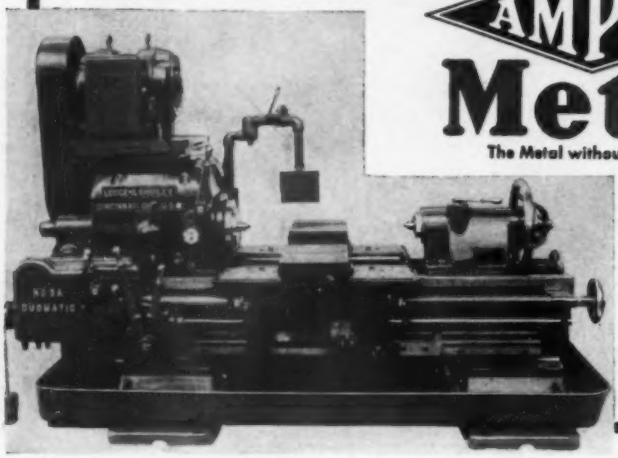
Like many other leading makes of machine tools—including the products of over 90 manufacturers—the Lodge & Shipley No. 3A Duomatic Lathe contains many parts of Ampco Metal at points where stubborn resistance to wear is imperative. • Check for parts of Ampco Metal, as a mark of quality in the machines you buy.

Write for bulletins.

Ampco Metal, Inc.
Dept. AM-1 Milwaukee 4, Wis.
M-2B

Reg. U.S. Pat. Off.

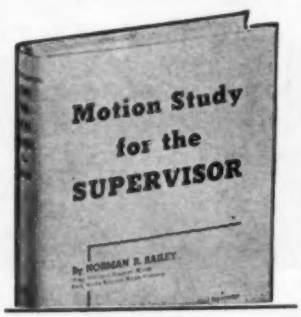
AMPCO Metal
The Metal without an Equal



For replacements
When bronze parts fail, it pays to replace them with Ampco Metal, which lasts several times as long as ordinary bronze. Ask nearest Ampco Field Engineer for suggested Ampco Metal stock list to fit the specific needs of your Maintenance Department.

How to stop waste motion and speed up production

This book gives a simplified, practical method of motion study for analyzing operations quickly and easily, enabling the foreman to employ motion study as a useful, everyday tool in speeding production and increasing output in his department. It shows how to detect wasted effort in operations, how to recognize the cause of ineffective work, and how to develop better job methods.



MOTION STUDY for the SUPERVISOR

By Norman R. Bailey

Wage Standards Engineer, Kodak Park Works, Eastman Kodak Co.

Price only $1.25

Now the foreman or supervisor may use motion study as easily as any everyday management process. With only a stop-watch and a simple, basic "formula", he can analyze any operation for improvement. Even operations to which it formerly was unprofitable to apply motion study may be analyzed by the simplified methods explained in this book. Here is a practical means of eliminating ineffective work and of spotting opportunities for methods improvement, with worthwhile cumulative benefits in greater production per hour.

Shows you:

—how to break down any operation into only 5 "work elements" common to all operations
—how to time an operation
—how to identify useful or wasted effort
—how to reduce repetitive motions by simple changes in layout and planning
—when to use simple fixtures for eliminating wasted effort
—how to train the operator in new methods

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Send me Bailey's Motion Study for the Supervisor, for 10 days' examination on approval. In 10 days I will send $1.25, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

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F. A. 11-11-43

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SOLENOID MOTOR CONTROL

QUALITY

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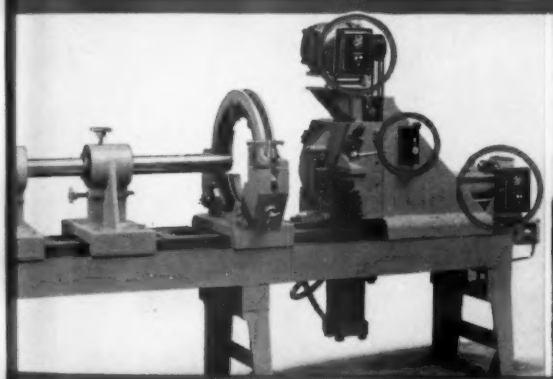
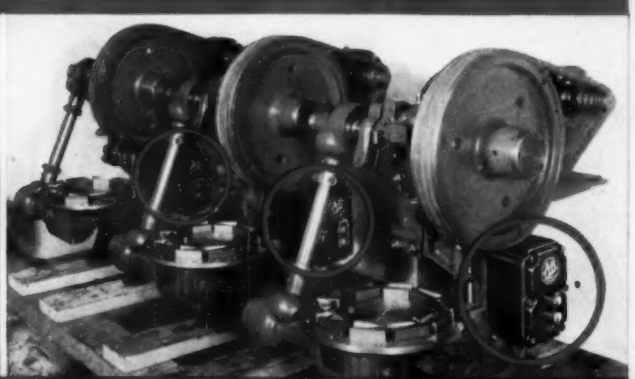
Bulletin 609 hand operated motor starters.

RECTOPLATERS—The Udylite Corporation
Bulletin 800 push buttons and 709 automatic starters.



SPECIAL MILL—Glenn & Anholt Tool Company
Bulletin 800 push button and 709 starters.

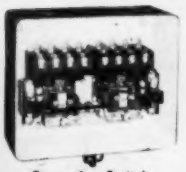


FUSE NUMBERING MACHINES—Buffalo Machinery Mfg. Company
Bulletin 609 manual starters for explosive atmospheres.

METAL PARTS WASHER—Industrial Washing Machine Corporation
Bulletin 712 combination starters for hazardous gas locations.

Manual Starter
Bulletin 609

Automatic Starter
Bulletin 709



Reversing Switch
Bulletin 705

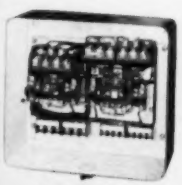
Combination Starter
Bulletin 712

Combination Starter
for hazardous gas

Drum Switch
Bulletin 353

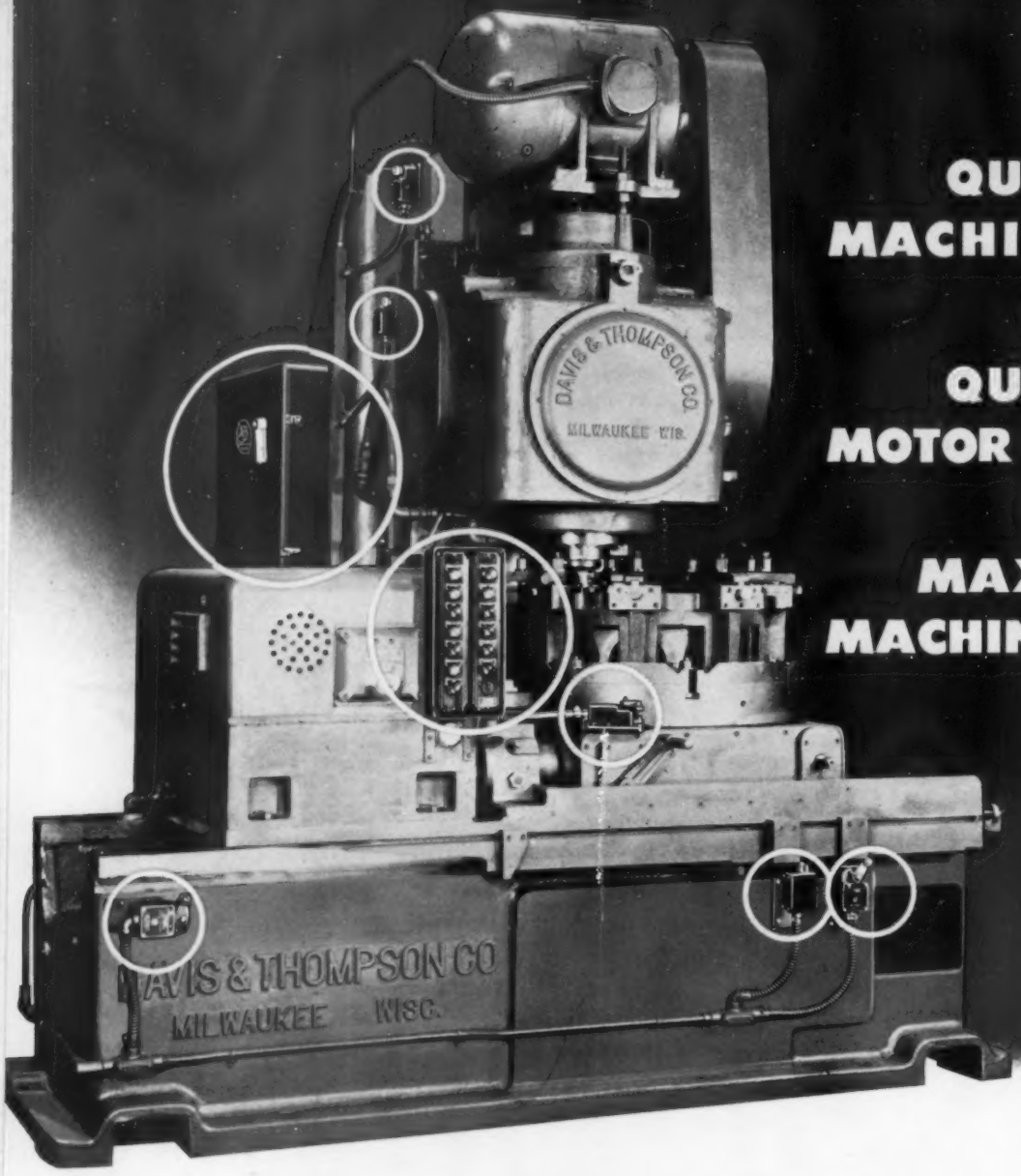
Push Buttons
Bulletin 800

Solenoid Relay
Bulletin 700



Multispeed Switch
Bulletin 715

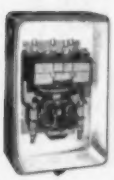
A-B



QUALITY MACHINE TOOLS + QUALITY MOTOR CONTROLS = MAXIMUM MACHINE OUTPUT

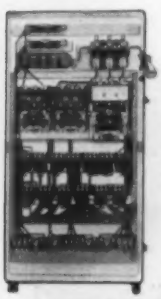
Relay

Limit Switch and Precision Limit Switch



Across-the-line starter

Push Buttons



Special Control Panel

Your guarantee of highest efficiency from operator and machine is to use Allen-Bradley controls for automatic sequence operations. Oscillograph tests show that A-B solenoid controls close in short, uniform pick-up intervals which assure consistent switching performance. No other magnetic controls provide such split-cycle accuracy which saves time and increases the production of your machine.

There's no time lost for maintenance either. A-B double break, silver alloy contacts never need filing, cleaning, or dressing. With only one moving part, there's nothing to get out of order. A-B controls are an asset to any machine.

Allen-Bradley Company, 1316 S. Second St.
Milwaukee 4, Wis.

ALLEN-BRADLEY

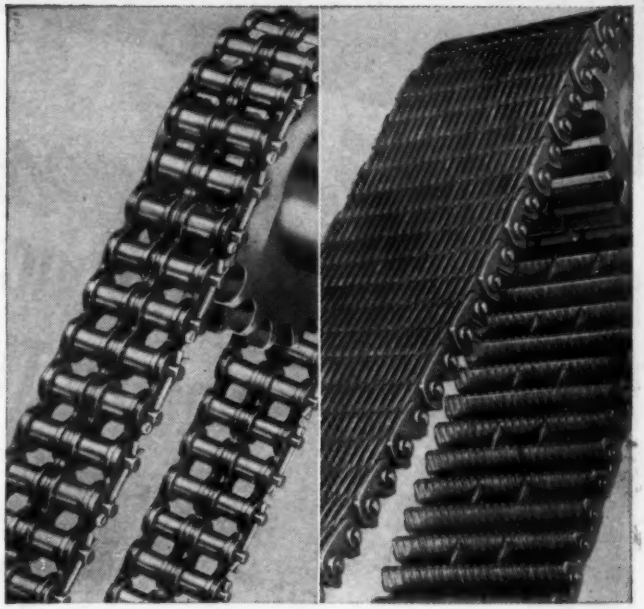
AUTOMATIC MOTOR CONTROL

MORSE

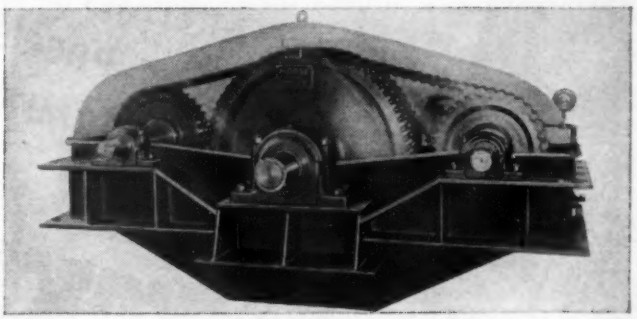
. . . WITH CLOSE TO HALF A CENTURY'S SPECIALIZED EXPERIENCE IN THE FIELD OF POWER TRANSMISSION MAKES VARIED EQUIPMENT TO FIT MANY NEEDS

Engaged in war work today, as are most manufacturers, Morse is supplying a wide variety of power transmission equipment to the armed forces. Morse Marine Transmissions are going into Navy vessels; minute Morse 3/16" pitch chain is being used in vital equipment; special Morse chains are being used in the breech block mechanisms of anti-aircraft guns; Morse Roller and Silent Chain is being used in tanks and automotive vehicles, and on the machines producing ordnance equipment.

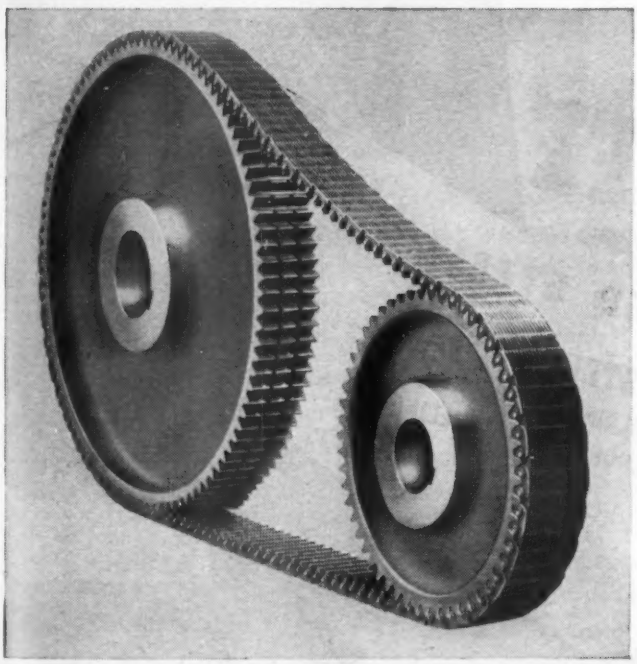
Specialists in their field, Morse offers a diversified line of power transmission equipment, enabling Morse to serve manufacturers more completely and better. Some of these products are shown here—most are available now, and all Morse products will, of course, be available when peace comes.



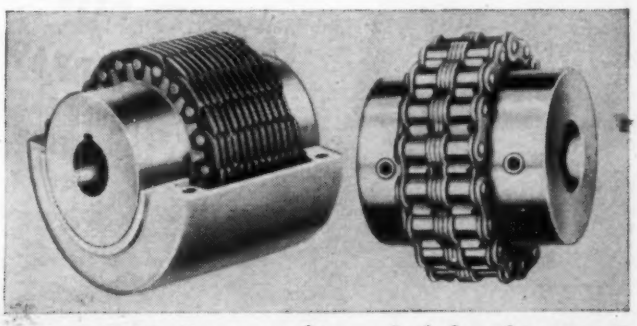
Morse Roller Chain and Morse Silent Chain is made in all standard sizes, and special Morse chains can be developed to meet specific needs. Morse Chain is widely used to transmit power loads of fractional HP to 5,000 HP, and for timing and conveying.



Morse Dual Drive and Marine Transmissions. Mounted in ships, on barges or rail cars, they harness the power of two or more diesel or gasoline engines to a single shaft at most efficient speed ratios.



Morse High-Speed Drives, flexible, yet positive as gears, are doing a more efficient job of transmitting power at high speeds, today. Pioneered by Morse, they are slip-proof, they eliminate power waste, increase machine output, will find wide peacetime usage.



Morse Chain Couplings are used to couple shafts and compensate for slight shaft misalignments. Other Morse power transmission products include over-running clutches, sprockets, marine chain reducers, Morflex Couplings.

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE Roller and Silent CHAINS

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NEVER INTERFERES WITH THE SINCERE RESOLVE OE EVERY WYCKOFF WORKER TO MAINTAIN CONSTANT PRECISION AND UNIFORMITY
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Precision
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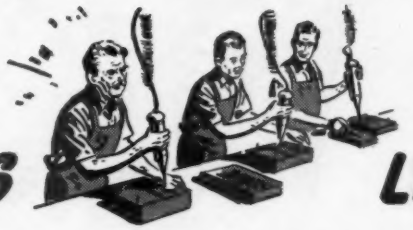
WYCKOFF DRAWN STEEL COMPANY
FIRST NATIONAL BANK BUILDING, PITTSBURGH, PA.
3200 SOUTH KEDZIE AVENUE, CHICAGO, ILLINOIS

LAST MONTH HE WAS SANTA IN THE TOY STORE

THIS MONTH HE TOOK HIS

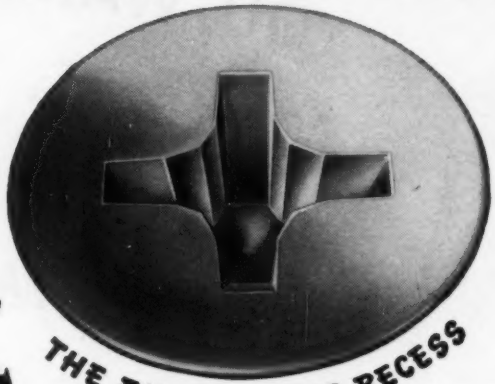
GRANDSON'S PLACE



AND HE'S DRIVING SCREWS LIKE A 21-YEAR OLD.

FOR THE PLANT WHERE HE WORKS USES THE RECESSED HEAD

SCREW THAT MAKES DRIVING DUCK SOUP... IT'S PHILLIPS →→→→



THE ENGINEERED RECESS

Anyone can drive Phillips Screws! Today, screw driving is one production job anyone can tackle without any special talent or training. The job that once called for strong arms and skilled hands now is a cinch for the operator who never tackled a screw driving job before!

It's the Phillips Recessed Head Screw that does the trick! With Phillips Screws, the greenest operator quickly becomes as skillful as a veteran. No fumbling . . . no wobbly starts . . . no slant-driven screws or dangerous screw driver skids. Workers turn out flawless jobs every time — and faster than ever before. Time studies prove that Phillips Recessed Head Screws step up screw driving speed as much as 50 per cent!

Imagine what this means to you in terms of man-and-training-hours saved . . . of increased production . . . finer workmanship. Then match these important advantages against slotted head screws — or any other type you may be using.

PHILLIPS Recessed Head SCREWS

WOOD SCREWS · MACHINE SCREWS · SELF-TAPPING SCREWS · STOVE BOLTS

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

Faster Starting: Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for green hands.

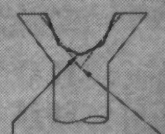
Faster Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

Easier Driving: Turning power is fully utilized. Workers maintain speed without tiring.

Better Fastening: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.

IDENTIFY IT!

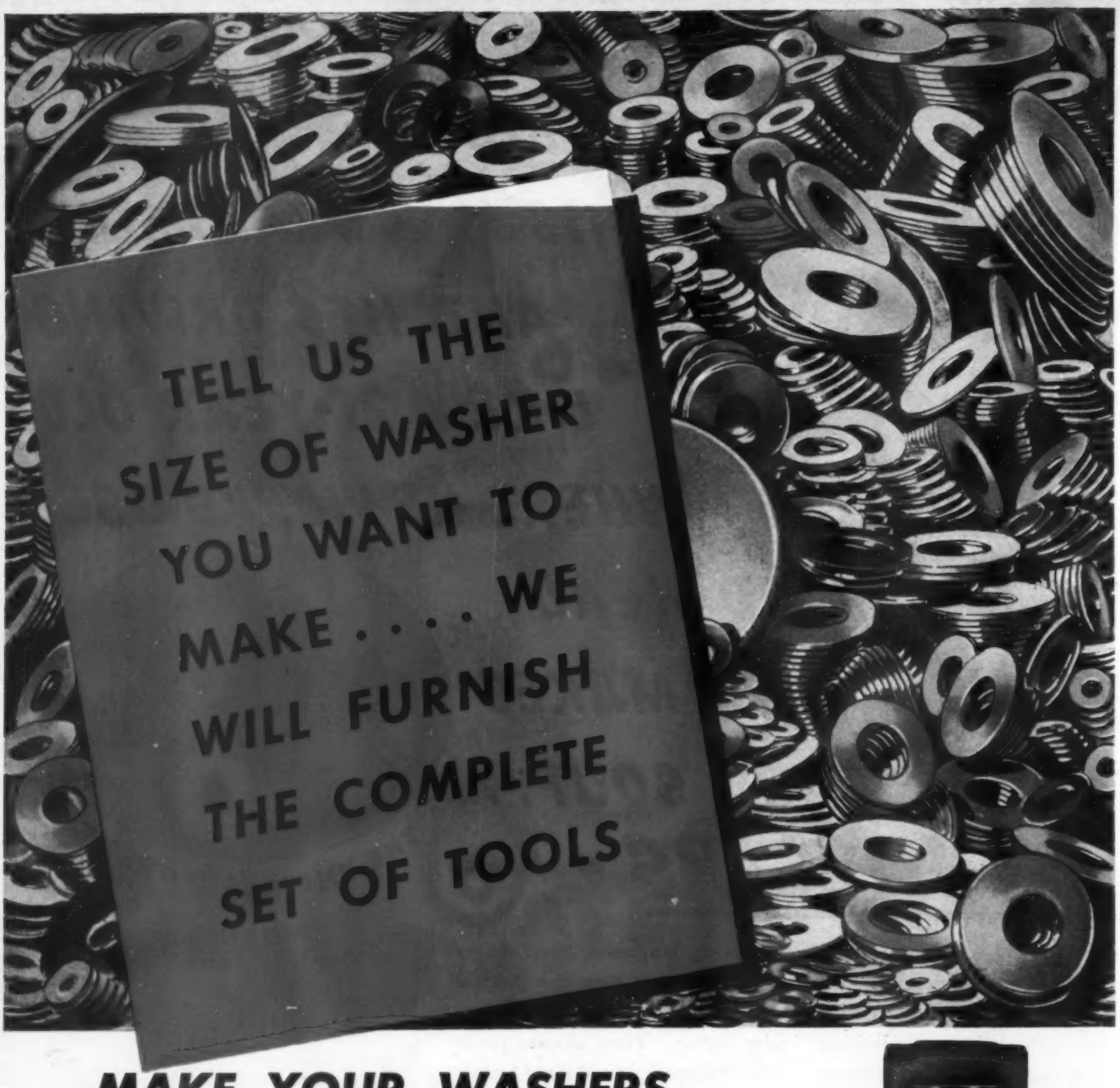
Center corners of Phillips Recess are rounded . . . NOT square.



Bottom of Phillips Recess is nearly flat . . . NOT tapered to a sharp point.

23 SOURCES

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoli Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.



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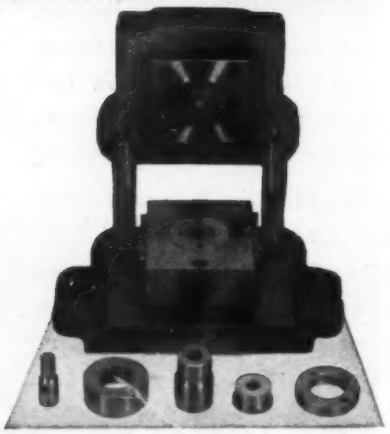

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for machining Monel, Nickel, Inconel

A tool that's designed right has a big "edge" in usable life on those fashioned less carefully.

The principal points to follow in grinding lathe tools for work on the INCO Nickel Alloys are:

1. Do not sacrifice needed support for the cutting edge by making the clearance angles larger than needed.

2. Grind sufficient true rake on the tool face to keep chip pressure, chip abrasion, and resultant frictional heat at a minimum and to provide for convenient chip disposal.

3. Endeavor to leave as much metal as possible at the nose of roughing tools.

4. Support tools well, allowing as little overhang from the tool post as possible.

This information is taken from the INCO Technical Bulletin "T-12—Machining."

Additional text in the 16-page booklet gives detailed information on clearance angles and rake. In addition, there are two pages of working sketches which show correct design for tools of all kinds . . . roughing, finishing, parting, planer, shaper, boring, threading, etc.

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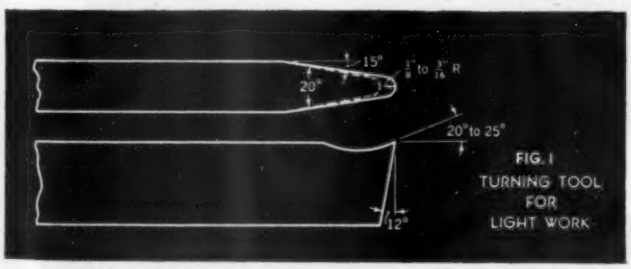

ROUGHING TOOL DESIGN, *one of 22 correct designs for High-Nickel Alloy tools shown in the booklet, "Machining."*

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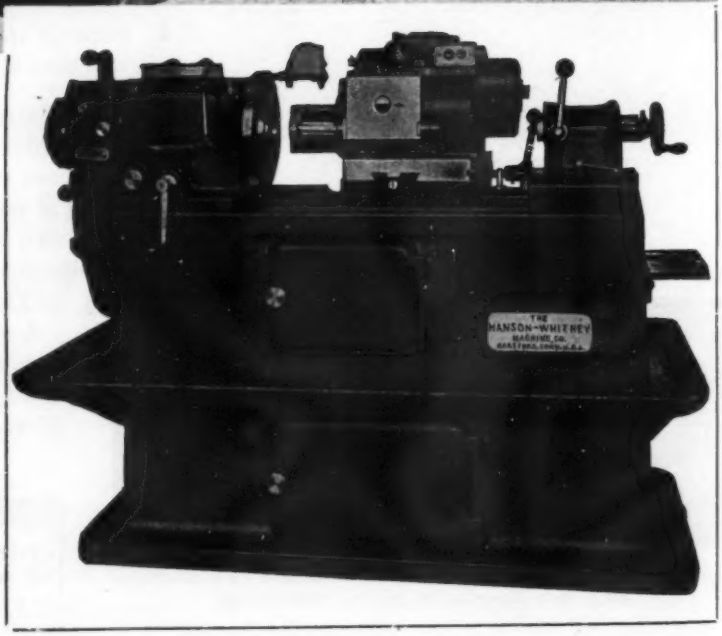

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with right angle head provides accurate torque control for installing spark plugs on aircraft engines to specified tightness.

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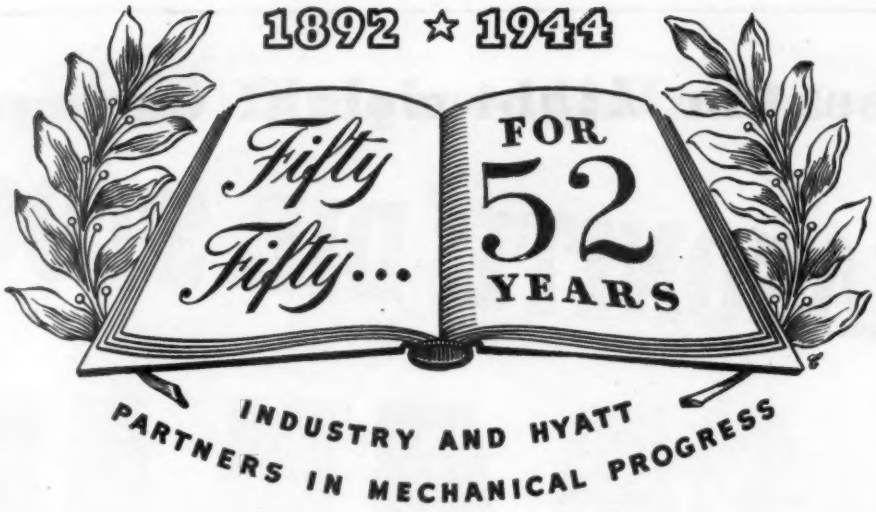

There's still a big job for all of us to do

NOTHING MATTERS NOW except the swift and certain winning of the war.

Through the prodigious production accomplishments of American industry, our men and our Allies have been able to swing the initiative in fighting to our side.

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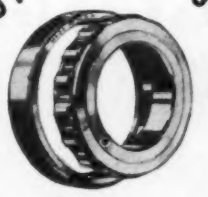
HYATT BEARINGS  **GENERAL MOTORS**

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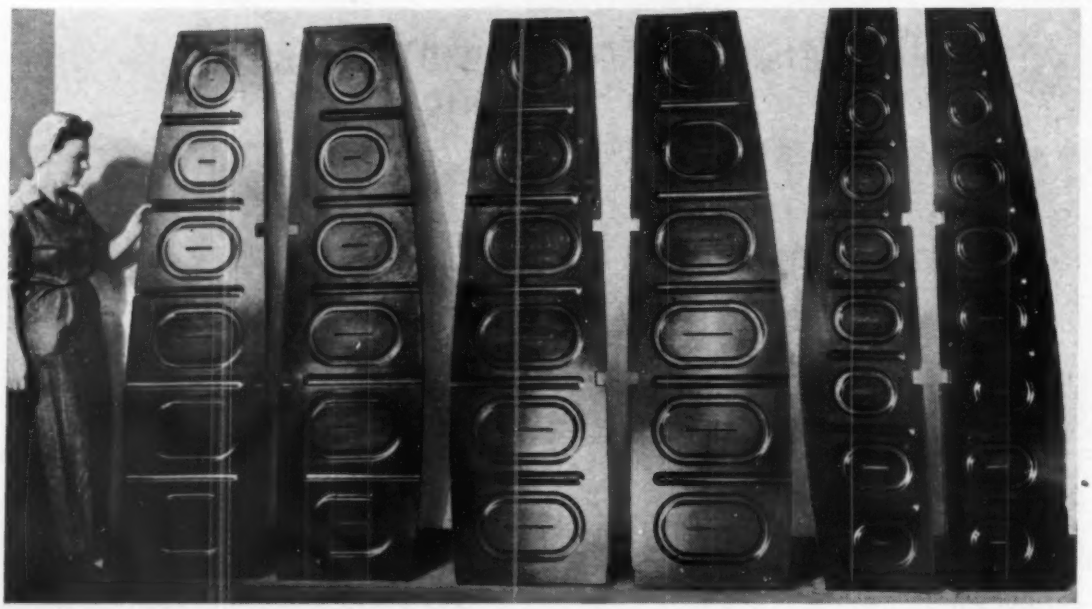
MASONITE* DIE STOCK



These six-foot wing rib dies, used in a hydro press, are made of Masonite Die Stock. Photograph courtesy of Schlenzig Manufacturing Company, Camden, N. J.

ALTHOUGH it's only one-sixth the weight of steel, Masonite Die Stock is proving to many aircraft manufacturers that it can stand up to the toughest jobs.

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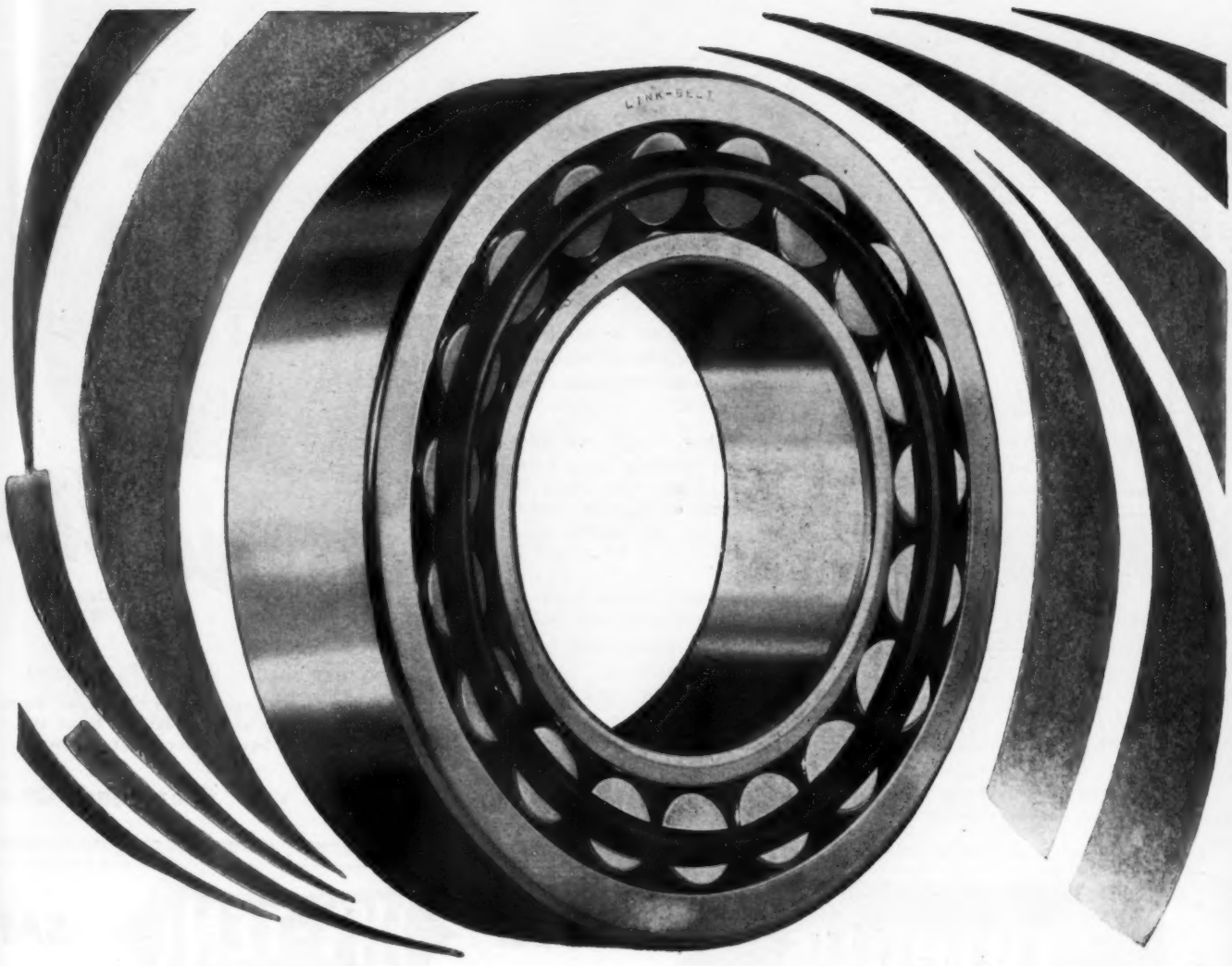

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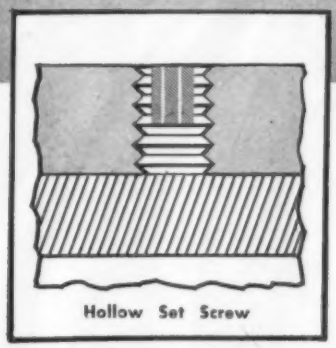

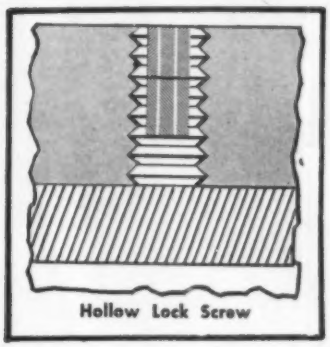

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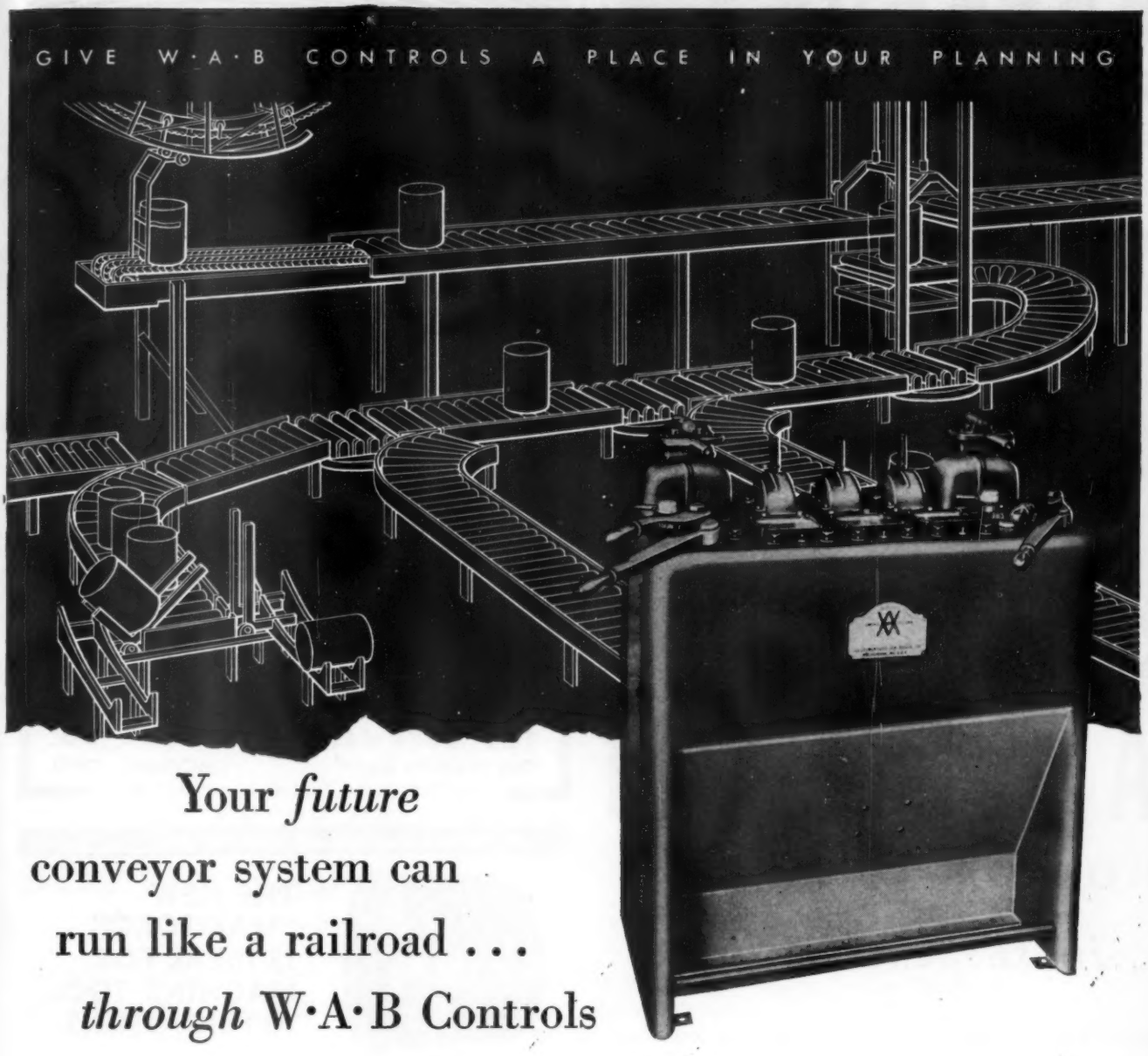

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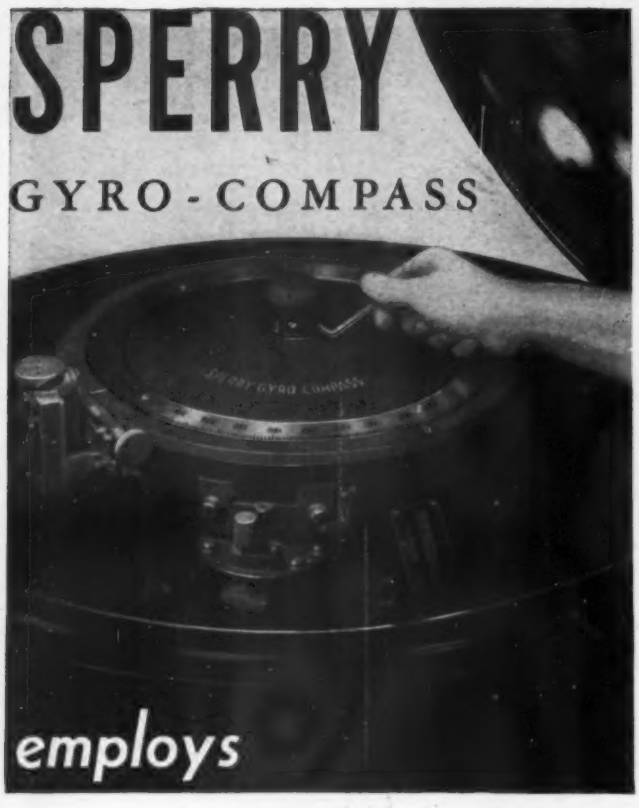

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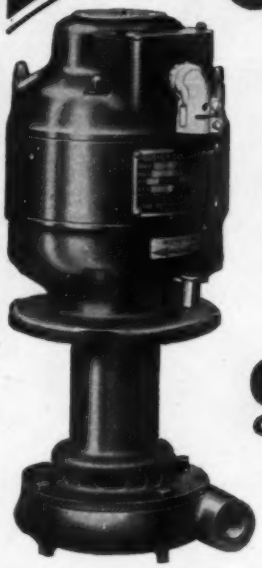

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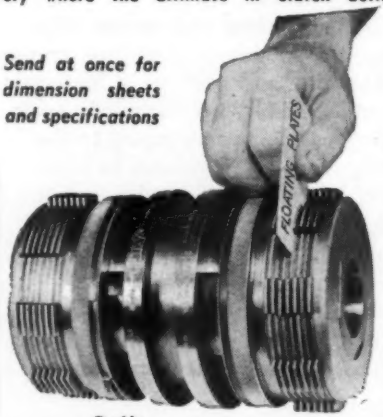

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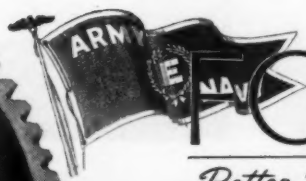

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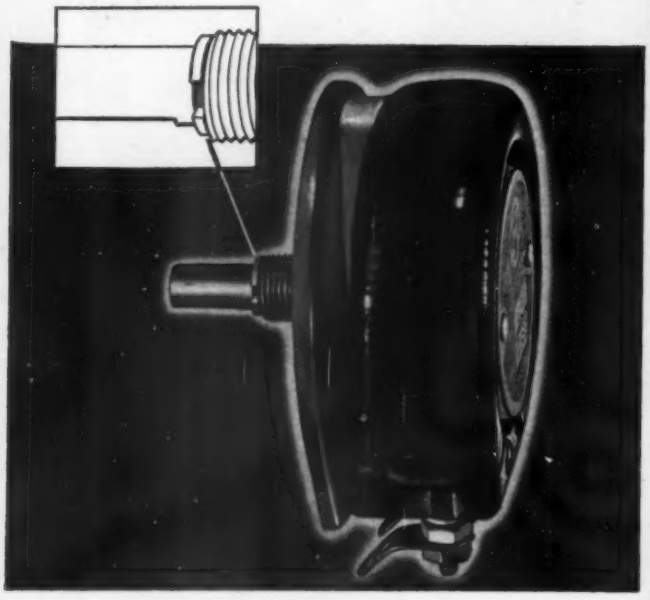

Every shoulder on your machines or on your metal products should be examined to see whether or not smart engineering could take advantage of these modern artificial shoulders on shafts or in housings.

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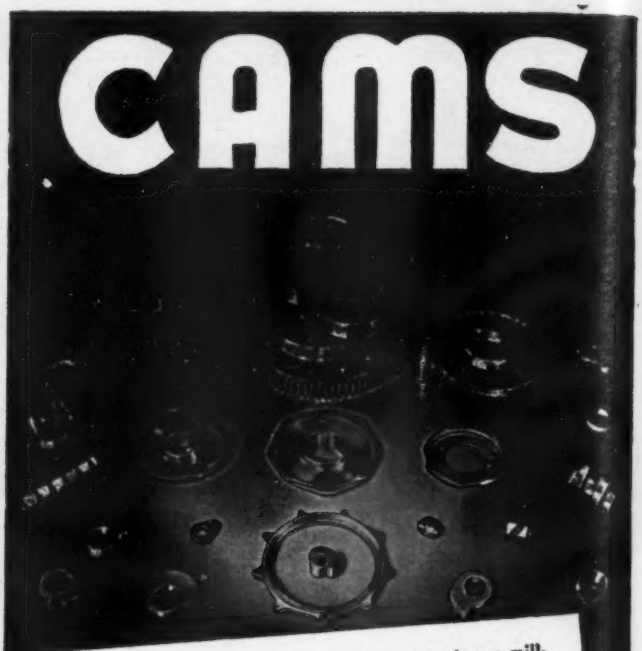
CAMS



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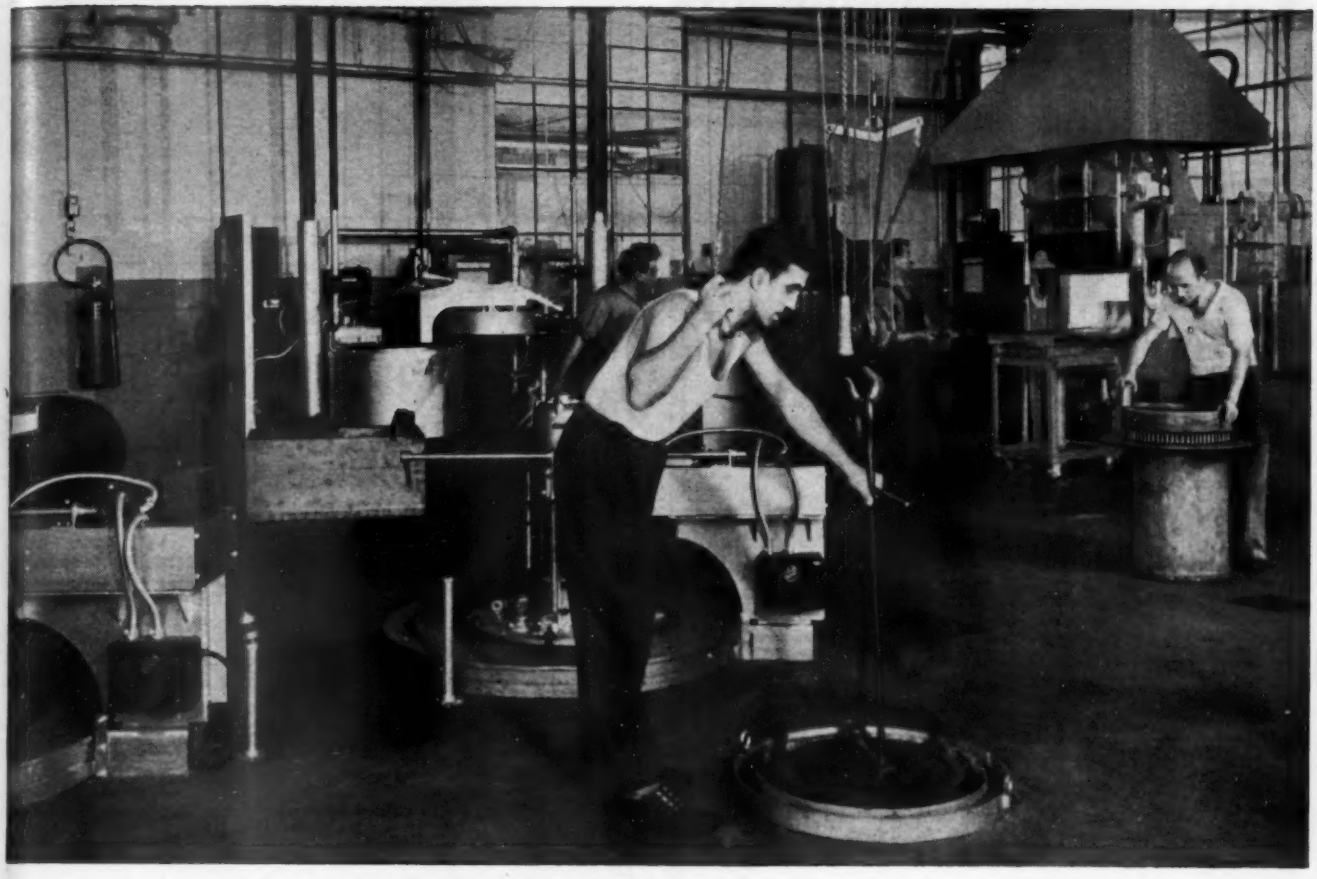

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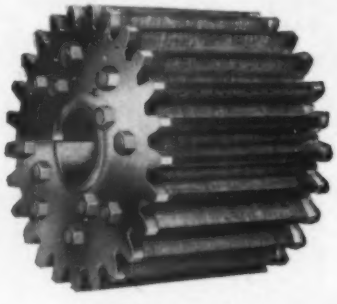

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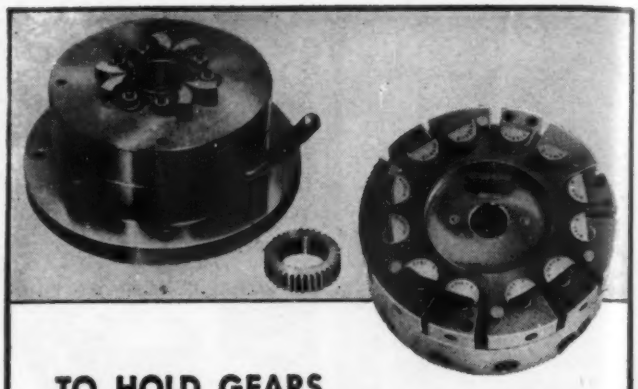

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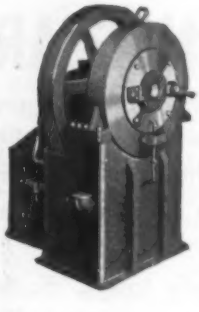

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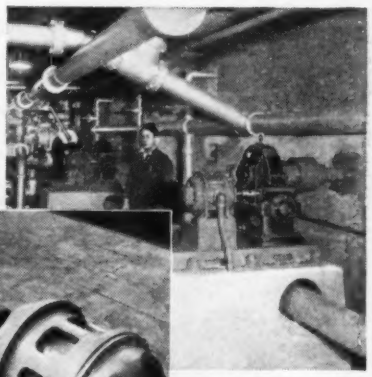

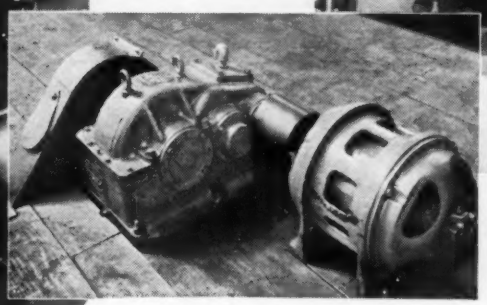

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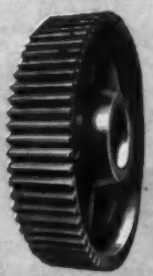

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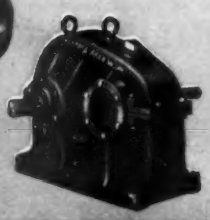

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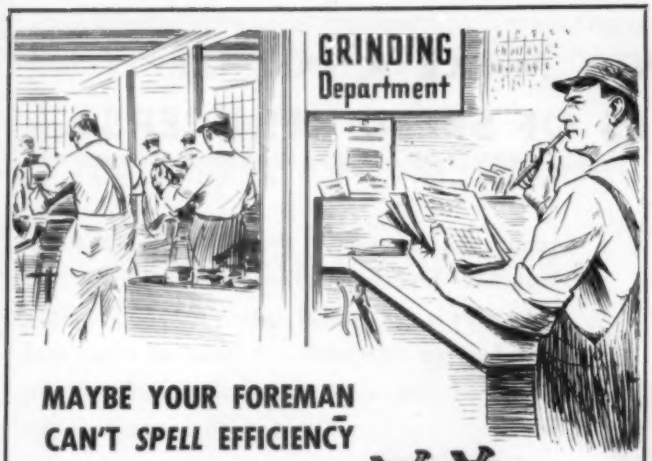

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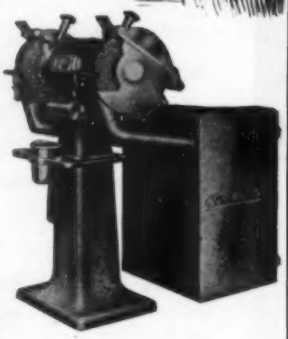

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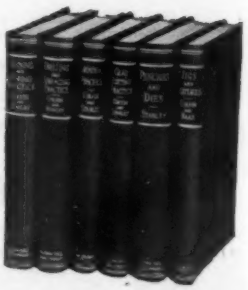

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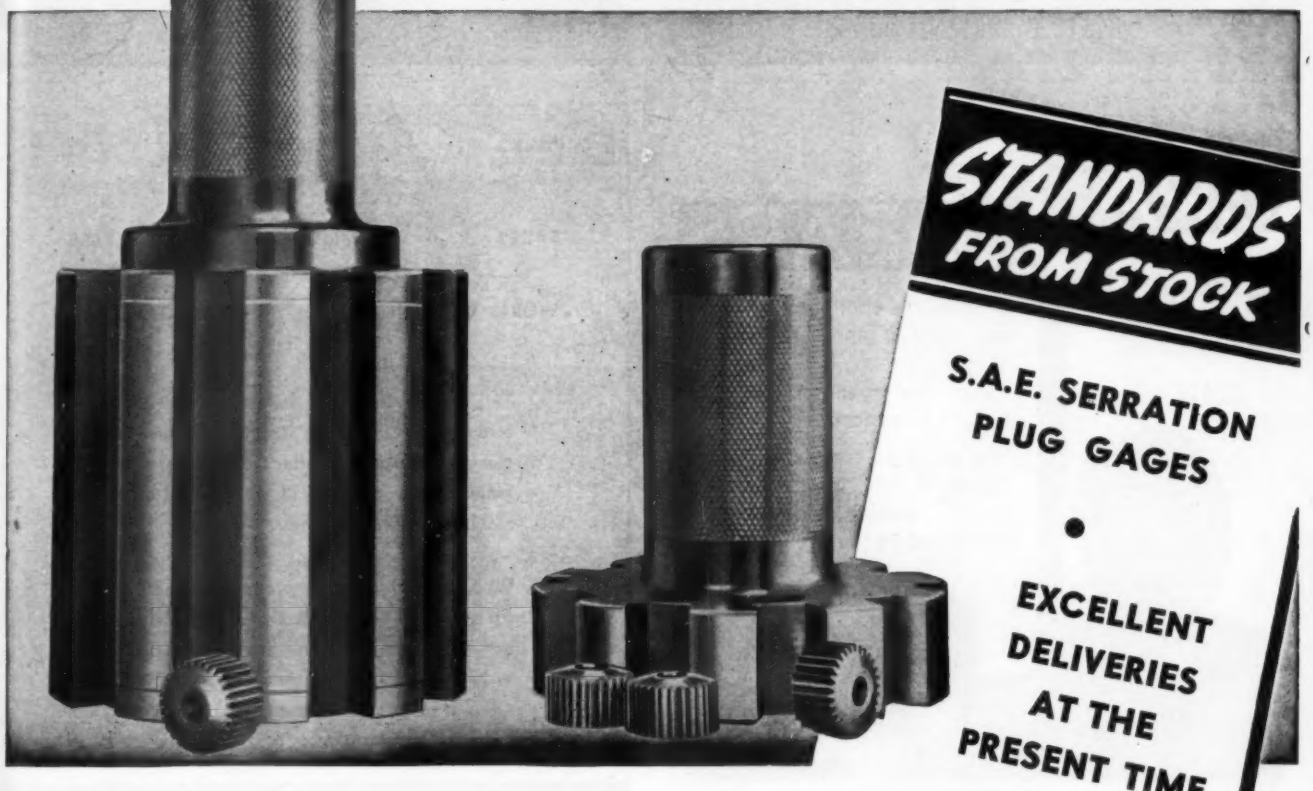

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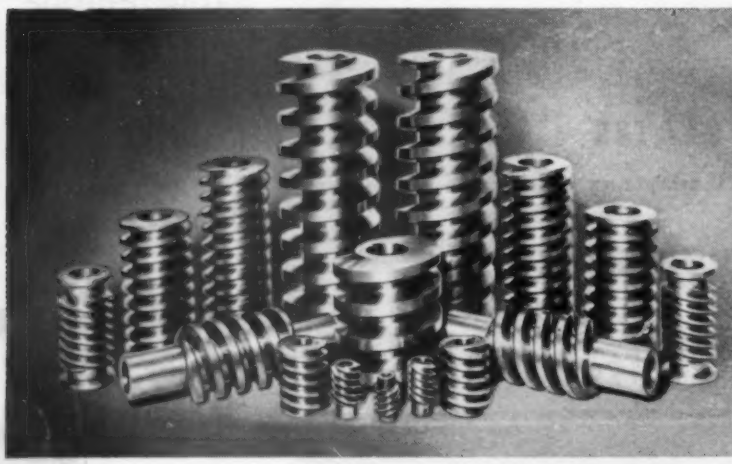

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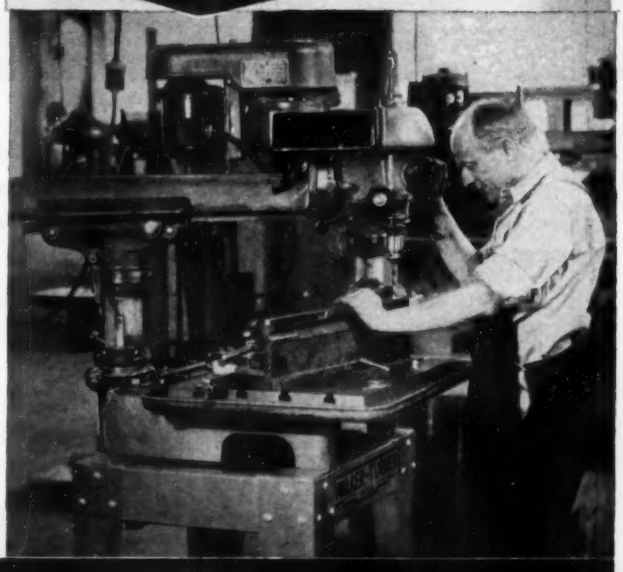

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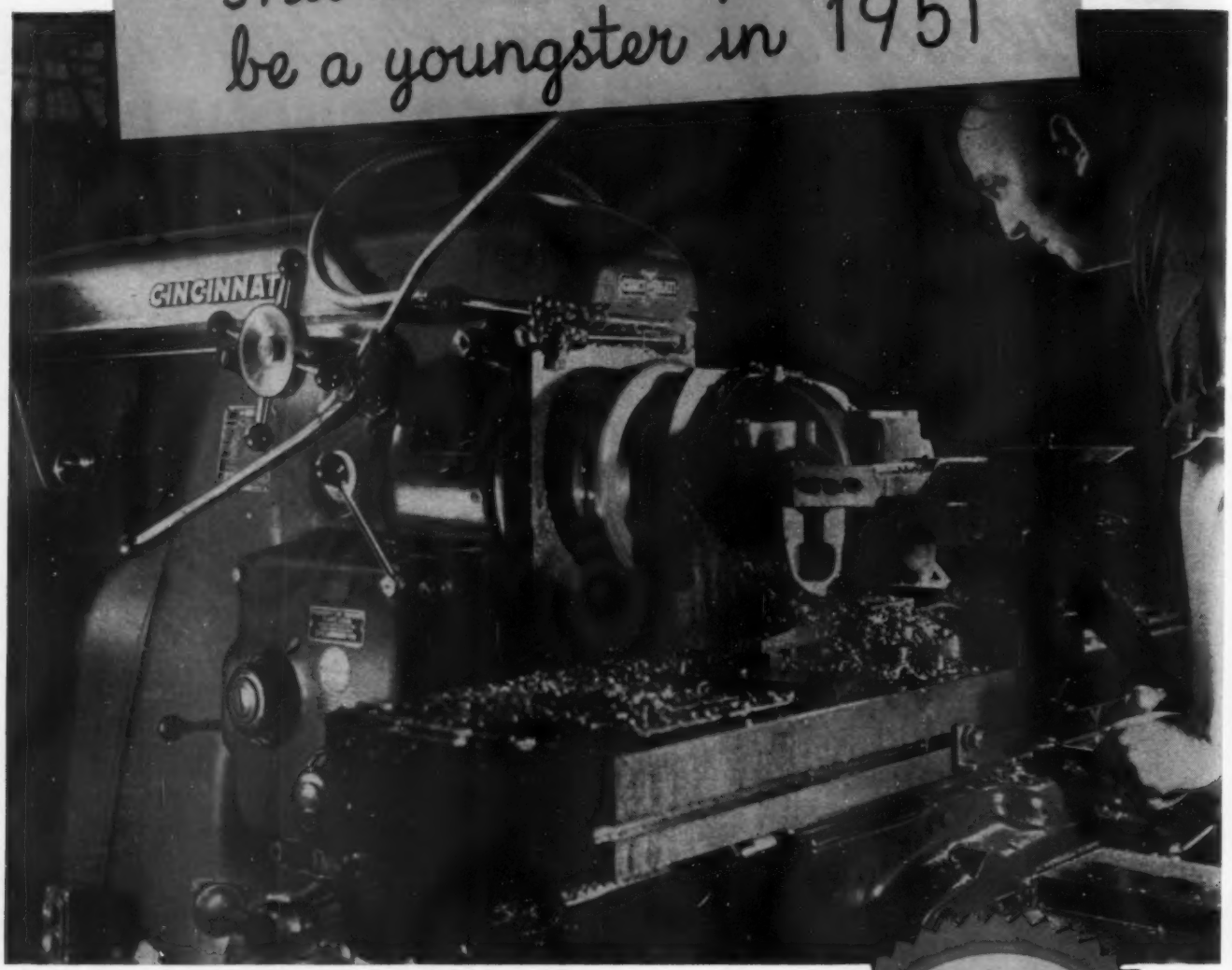

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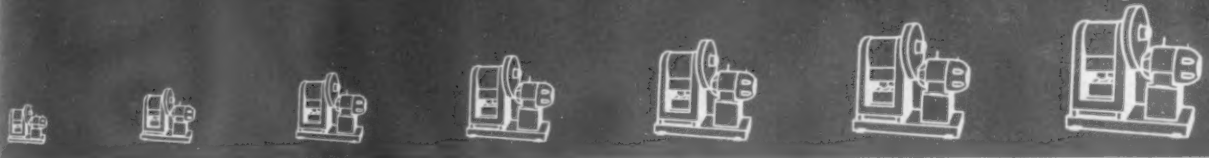

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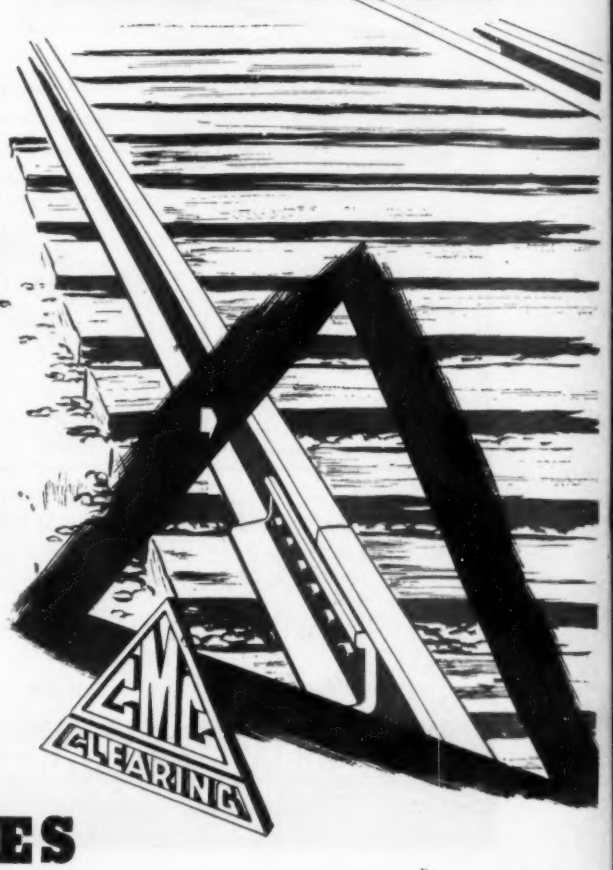

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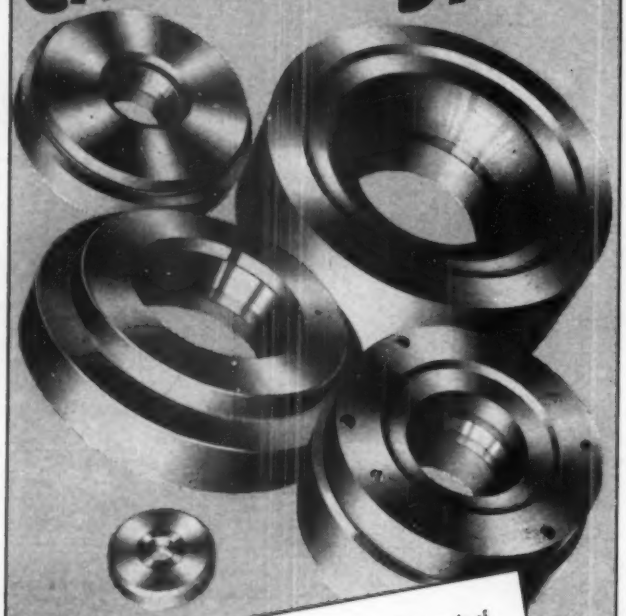

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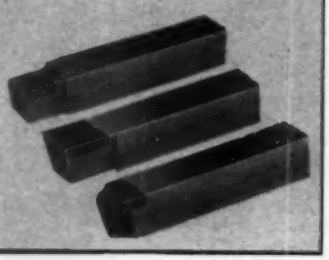

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THE V & O Press Co.
HUDSON N Y

BAUMBACH STANDARDIZED DIE SETS

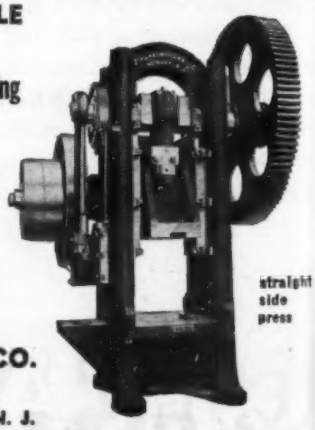
BETTER-MADE
DIE SETS
AT LOWER COST
46 Styles—195,000 Sizes
E. A. BAUMBACH MFG. CO.
Machined Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

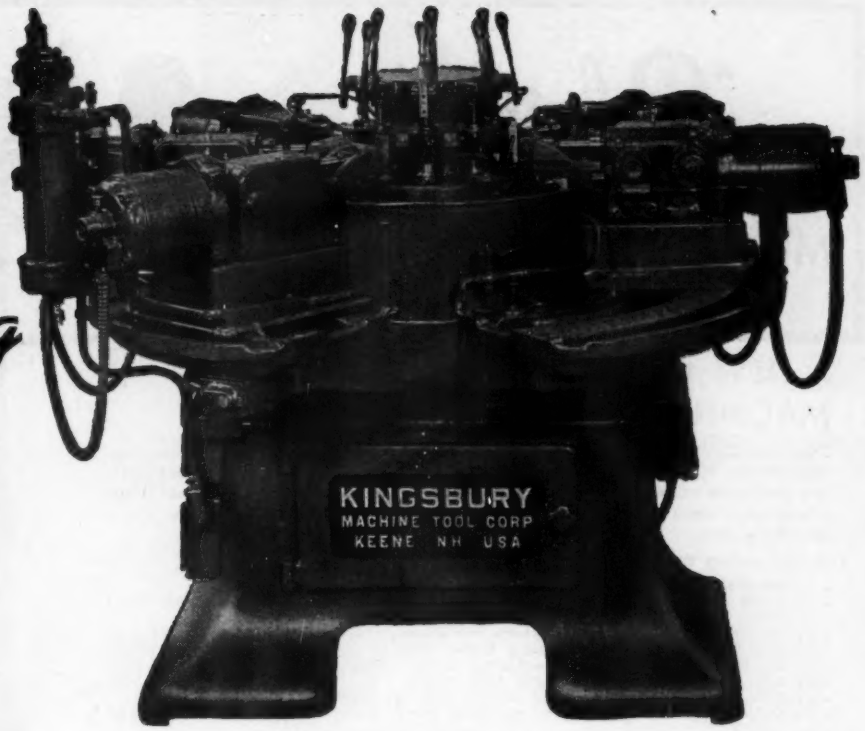
Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



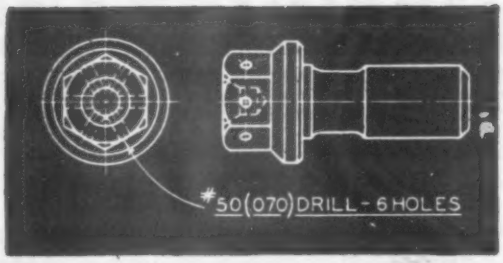
ZEH & HAHNEMANN CO.
180 Vanderpool Street
NEWARK N. J.

Loading and Unloading While Drilling assures Continuous High Production



FLEXIMATIC

by KINGSBURY



THIS IS A FLEXIMATIC AIRPLANE JOB!

Kingsbury Standard Units for drilling, reaming, boring, spotfacing and milling can be mounted in any combination, operated automatically and changed over quickly and easily to suit the requirements of the work to be handled.

This six-spindle FLEXIMATIC is set up for drilling lacing holes in the heads of screws for airplane motors. High production, so essential to parts involved in the speeded up program of this important phase of National Defense, is being achieved with minimum effort on the part of the operator.

The main turret of this FLEXIMATIC contains eight individual turrets which index 60° at each index of the main turret. Each of the six automatic drilling units on the machine drill a hole from the outside face of the hex head into the center only. The operator merely loads and unloads at the loading station while the holes are being drilled at the other stations on the machine. All six drilling operations are performed in a single chucking of the work.

Speed, convenient handling, accuracy and continuous production are universally recognized advantages offered by FLEXIMATICS regardless of the nature of the job assigned them to handle. The specific work being performd here is typical of many others where FLEXIMATICS are the machines for jobs calling for the maximum in time savings.

KINGSBURY MACHINE TOOL CORPORATION
KEENE NEW HAMPSHIRE U S A

"Blount"

MODEL H.S. HIGH SPEED GRINDER

Send for descriptive literature

A NEW UTILITY SPECIAL PURPOSE MACHINE FOR FAST WORK . . . .

This new BLOUNT machine, of the quill type, has been developed to speed-up war work. It is a high speed notching or special purpose grinder for such use as bevel edge grinding on clicker dies, flutes of taps, cutting off high speed steel tools and many other grinding or polishing operations on parts including gear tooth polishing.

Outstanding features include:

- . . . removable high speed precision quill type spindles.
- . . . V-belt motor driven quills with motor mounted on hinged bracket in pedestal base.
- . . . two adjustable work tables which can be quickly removed and provided with guard adjustment for exposing lower half of grinding wheel to facilitate handling of tool room or production requirements.
- . . . quill lubrication through sight feed oilers.
- . . . push button manual operated switch with overload protection.
- . . . standard equipment includes complete set of pulleys for motor thereby providing wide speed range.

GENERAL SPECIFICATIONS

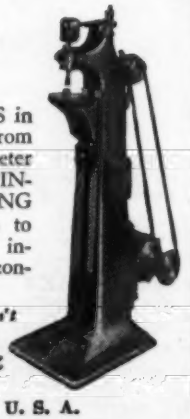
Base to spindle center—39"
Tables (2)—10"x8"
Base—22½"x15"
Wheels (2)—10"x½" (max.); ⅛" (min.)
Wheel arbor—¾"
Motor—1 HP.
Speeds (spindle) (standard) 9900, 5750, 3570 R.P.M.

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** *Units*

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Metal Stampings

"DUPLICATED WITHOUT DIES"

If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.

Send for this Catalog . . . "METAL DUPLICATING WITHOUT DIES"

It illustrates many stampings or parts made without dies, gives full details on DI-ACRO machines and shows how they may readily be adapted for various applications. Request your copy now.

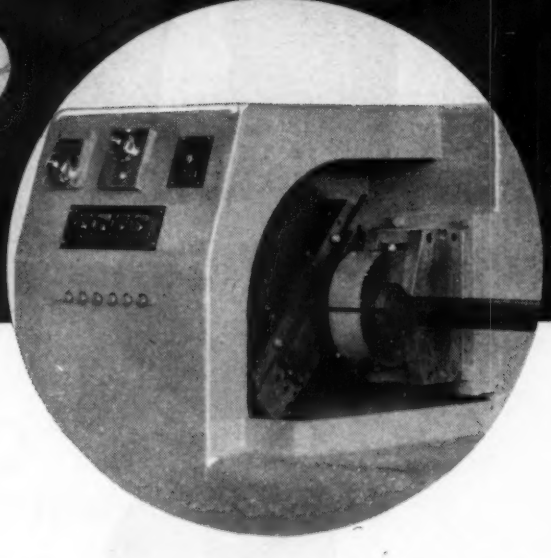
O'NEIL-IRWIN DI-ACRO MFG. CO.
311 EIGHTH AVENUE SOUTH MINNEAPOLIS 15, MINNESOTA

Announcing THE NEW ETNA TUBE CUTOFF MACHINE

★

Tube Cutoff Machines of the Flying or Stationary Type are obtainable—Stationary Type shown here.

Below—machine with cover removed, showing position of tube for cutting off.



Check These Advantages

Tube held stationary while being cut off.

Stationary liner inside rotating spindle (no rotating parts contact tube . . . eliminates scratching, marking).

Tubes need not be straightened before cutting. (Bent tubes cause whipping action when cut off on machines that revolve tube.)

Cutoff cycle completely automatic. Tube is clamped, cut off and unclamped by pushing one button. Note that control dials and buttons are mounted within approximately a one foot area to facilitate easy control by even inexperienced operators.

Machine is one-package unit—completely self-contained. Connect three wires and machine is ready to operate.

Infinite range of smooth spindle speeds with adjustable speed A.C. motor.

Completely hydraulic operated fingertip control of smooth, infinite range of feeding rates.

No cams or gears to change—just turn a dial for complete range of feeds and speeds.

Eliminates operator fatigue experienced with old type hand feed cutoff machines.

No experience needed to operate the machine.

Easily adjusted rapid traverse and return saves time—speeds production.

Minimum burr on cut tube—no tearing—lathe type cut.

Generous clamping area on tube prevents marking or crushing thin wall tube.

Quick change of clamping and guide liners speeds work.

Rotating spindle well guarded—no rotating tube to catch careless operator.

• The new ETNA Tube Cutoff Machines are entirely self-contained units. Drive motor, hydraulic pump and motor, hydraulic cylinders, and equipment are mounted within the safe base with rotating cutter head. The spindle, on which the tool holders are fastened, is mounted on Timken tapered roller bearings and is V-belt driven by a Louis Allis "Adjusto Speed" Motor. Machines are built in capacities to cut off tube ranging from ½" O.D., ⅛" Wall up to 12" O.D., 1½" Wall. Machines to handle tube of over 5" O.D., ½" Wall are built to your order.

SEND THE COUPON TODAY

Get full details on the new ETNA Tube Cutoff Machine! Complete operating and construction data will be sent at your request.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

The ETNA Machine Company

3400 MAPLEWOOD AVENUE

TOLEDO 10, OHIO

THE ETNA MACHINE COMPANY
3400 Maplewood Ave., Toledo 10, Ohio

Please rush full information on the ETNA Tube Cutoff Machine to—

NAME .....

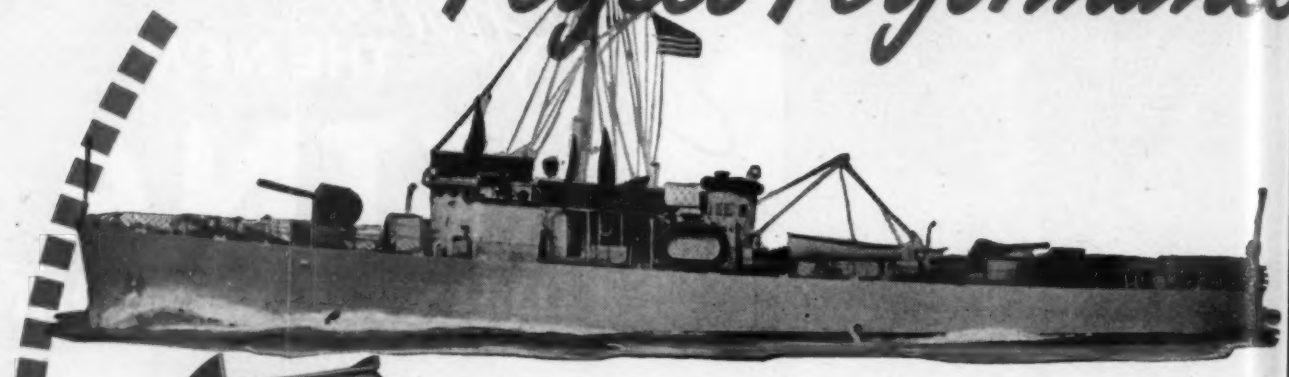
COMPANY .....

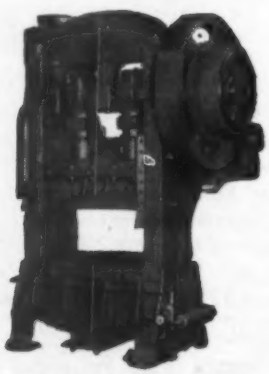
STREET .....

CITY ..... ZONE NO. ..... STATE .....

FASTER MANEUVERABILITY WITH FAWICK CLUTCHES

Perfect Performance





This revolutionary new clutch controls power by air. It is economical. It always works. It needs no arms, levers or toggles. It requires no lubrication or adjustments. Maintenance cost is exceptionally low.

The Fawick Airflex Clutch and Brake has earned its place in heavy-duty service where there is no room for failure. Hundreds are in use on new Navy and Merchant Marine vessels because, more than any other clutch, they permit faster maneuverability — faster starts, quicker stops.

If your equipment needs a clutch, brake, slip clutch or flexible coupling, you are invited to send us details and get our recommendations. Booklet on request.

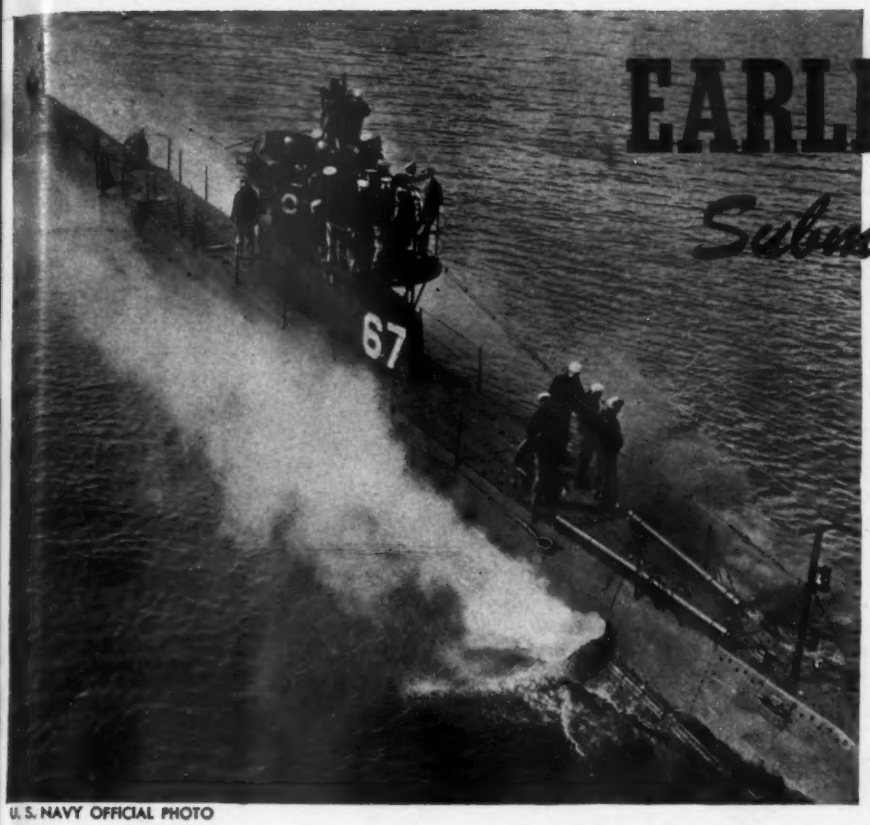
For All Heavy Machinery

On Punches, Shears, Turbines and severe-duty drives, Fawick Airflex Clutches and Brakes are compact, silent, smooth and shock-free. They slip readily under overloads and save on power.

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. Cleveland 11, Ohio
In Britain, **Crofts Engineers, Ltd., Bradford, England**

FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR



U. S. NAVY OFFICIAL PHOTO

EARLE GEARS *in* *Submarine Service*

Here at Earle Gear one of our special tasks is to produce capstan operating machinery for submarines. Obviously, these units are required to operate unfailingly under the most severe conditions. Where dependability is vital, you'll find Earle Gears giving smooth, positive operation and greater gear life.

Consult Earle Gear on your requirements

The EARLE GEAR & MACHINE CO.
4723 Stenton Ave., Philadelphia 44, Pa.

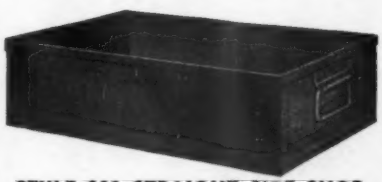
SALES OFFICES: 149 Broadway, New York 6, N. Y.
901 Davis Avenue, Pittsburgh 12, Pa.

EARLE GEARS

IMMEDIATE SHIPMENT

STEEL BOXES

FOR YOUR PRODUCTION NEEDS



STYLE 200 STRAIGHT SIDE SHOP BOX

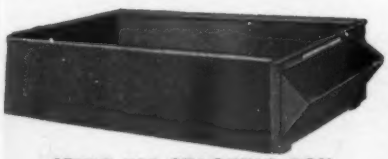
A straight side shop box with drop handles each end. Excellent for shop use where stacking feature is not required.

No. 201	6" x 9"	x 3½"	20 ga.	$ .40 Ea.
No. 202	8" x 12"	x 4"	20 ga.	$ .45 Ea.
No. 203	9" x 13½"	x 4½"	19 ga.	$ .60 Ea.

STYLE 300 STACKING BOX

Just right for your small parts. Light in weight, easy to handle. Equipped with drop handle each end. Runners save wear on bottom of box and act as positive stacking lock.

No. 301	6" x 9"	x 3½"	20 ga.	$ .55 Ea.
No. 302	8" x 12"	x 4"	20 ga.	$ .60 Ea.
No. 303	9" x 13½"	x 4½"	19 ga.	$ .75 Ea.



STYLE 700 STACKING BOX

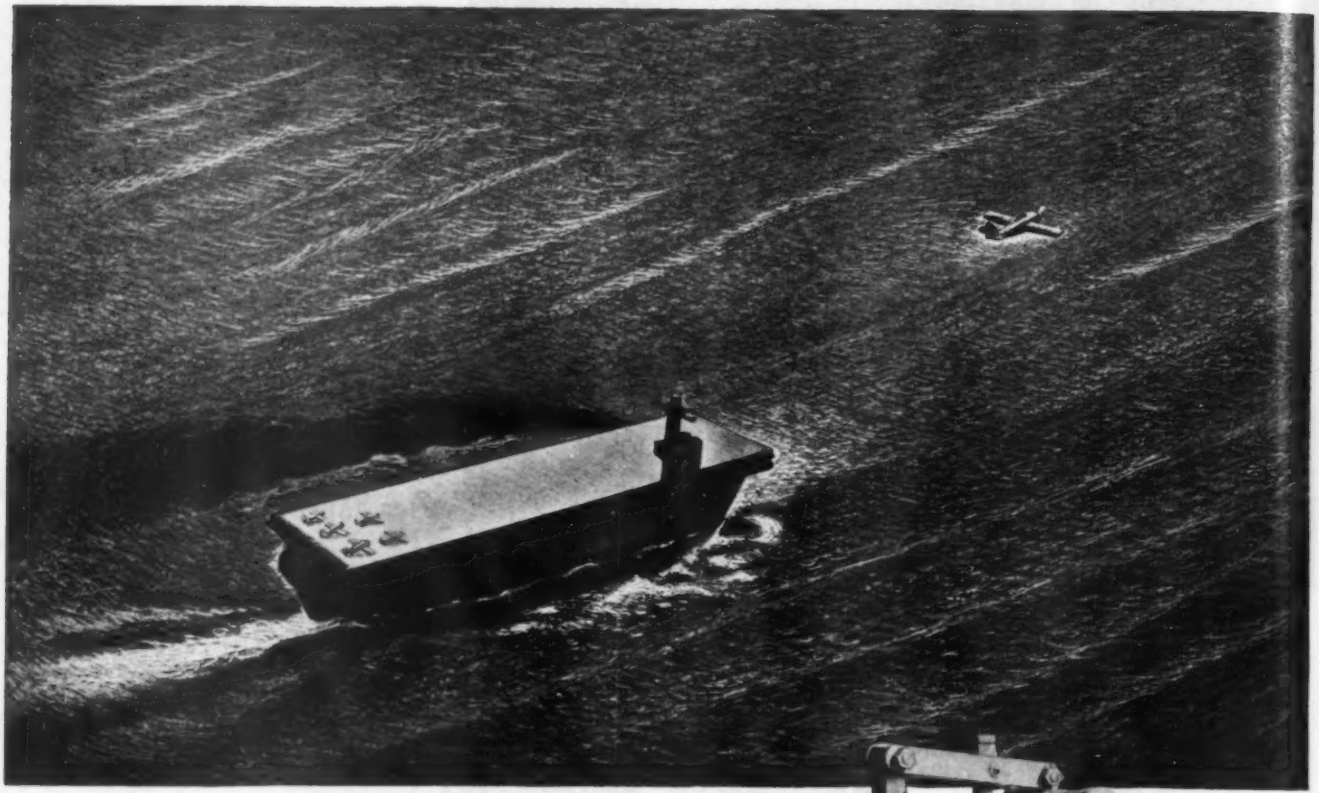
A light weight box designed for quick identification of contents. Will stack with No. 303. Finished olive green enamel, baked on.

No. 703	9" x 13½"	x 4½"	19 ga.	$ .95 Ea.

Prices F.O.B. Factory, Phila. — Any quantity

AMERICAN METAL WORKS, INC. 1509 Germantown Avenue, PHILADELPHIA 22, PA.

The Pacific is a mighty big ocean!



● *Hundreds, perhaps even thousands of miles from land, the equipment on our Navy's fighting ships must not fail. We are proud of the part being played by equipment designed and built by Bayard, . . . today and every day serving to hasten victory. Pictured here is a Steam Throttle Valve, specifically designed for the Uniflow Engines on Aircraft Escort Carriers.*

BAYARD

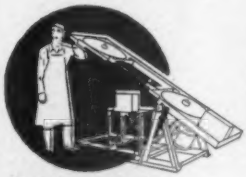
M. L. BAYARD & CO., INC. • ENGINEERS AND MACHINISTS PHILA., PA.

The third star of continued achievement has now been added to the Bayard Navy "E" Pennant

It's a New Year's Question

WHY GET A WELLS NO. 8?

WELLS No. 8
Capacity: Rectangle 8" x 16"
(spec. bowed guides) 5" x 24"
Rounds 8" dia.
Speeds: ft. per min. 60, 90, 130
Motor Specifications optional



No. 20
Designed for cutting risers off propeller blades

No. 12
Heavy duty production Saw

No. 9
General Foundry Saw

STOCK STANDS
Indispensable item for your shop

Wells SAWS
THE SIGN OF SERVICE

Here's why!

VERSATILE — Wells No. 8 Metal Cutting Band Saw will cut a wide variety of metals in various shapes. In single or ganged-up work it will take overall sizes up to 8" x 16" rectangles or 8" rounds.

ACCURATE — Vibrationless operation assures uniform cutting.

FAST — The continuous cutting method employed insures a cool blade thus enables the operator to obtain maximum cutting speed for the type of stock being cut. Adjustable to 3 speeds.

ECONOMICAL — Cutting capacity and quality are paramount factors in choosing a WELLS Saw. Then too, it requires but a ½ H.P. motor and 2' x 6' of floor space.

Ask your mill-supply dealer to show you a WELLS, Model 8, in actual operation — you'll like its performance.

A large stock of blades is available at all times

To get complete specifications on WELLS Saws, write for the new WELLS Catalog.

Wells Has Established Leadership

WELLS MANUFACTURING CORPORATION

METAL CUTTING BAND SAWS

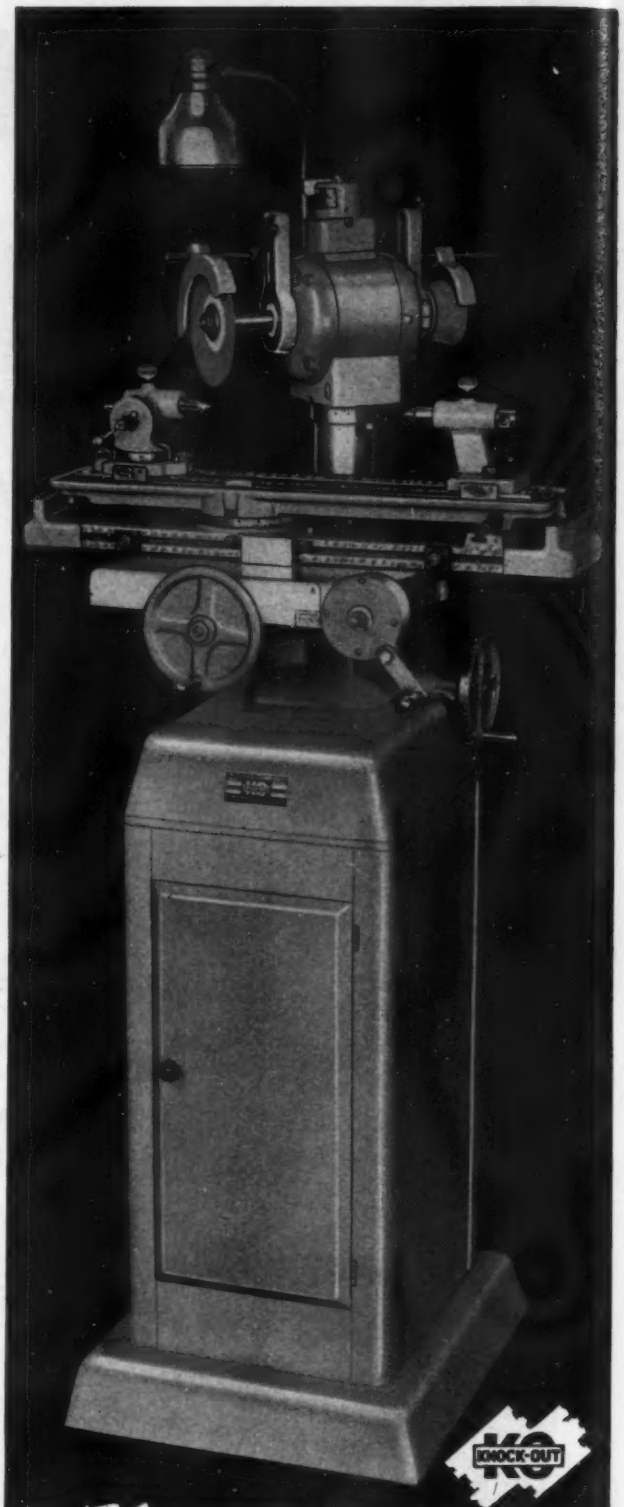
505 ROOSEVELT ROAD • THREE RIVERS, MICHIGAN

STA-KOOL
TOOL HOLDER

What makes a really fine tool? Proper design and construction, of course, as well as quality of material and workmanship, plus the maker's integrity. JKS Diamond Tools are designed to meet all production problems, but it frequently happens that special conditions call for special treatment. In such cases we make a study of these conditions, preparing a JKS Diamond Tool that will stand up to the most exacting tests. You may add our experience and facilities to your organization by telephoning our nearest district office. This will bring prompt response and wholehearted coöperation.

J. K. SMIT & SONS

157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.



KO KNOCK-OUT

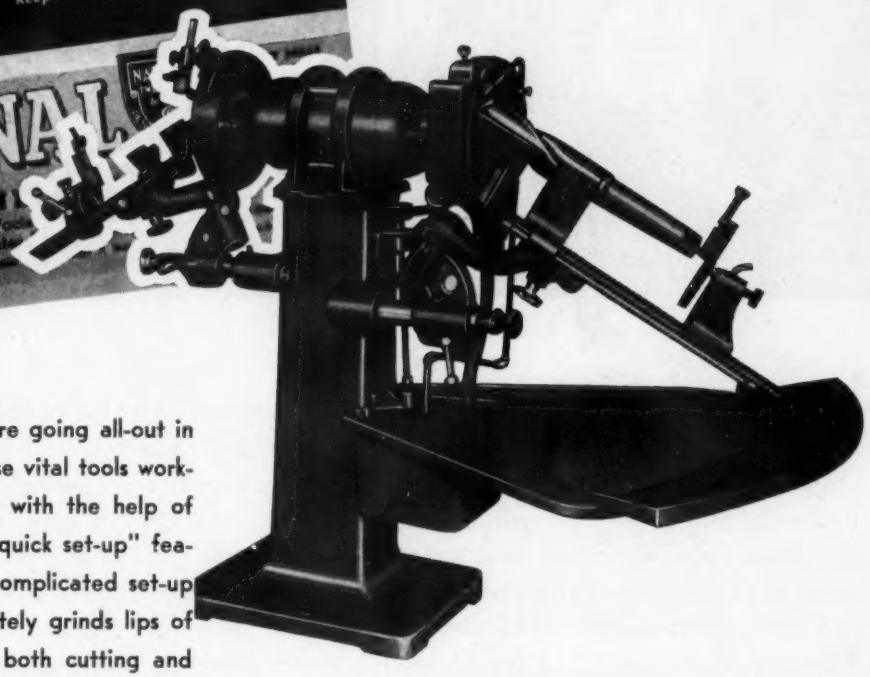
Knock-Out
UNIVERSAL TOOL GRINDER

Write for Bulletin UTG-43-A. M.

K. O. LEE COMPANY
ABERDEEN SOUTH DAKOTA

A BREAK FOR THE AXIS
Much tool breakage is caused by over-dulling. Cutting tools should be examined periodically while in action; they should be sharpened at regular time or production intervals, regardless of their apparent condition.
Besides being less liable to breakage, sharp tools will:
1. Last longer, because less material is removed when re-sharpening.
2. Produce more, and with better finish.
3. Insure utmost accuracy, with fewer rejects.
4. Reduce tool and labor costs per unit.
Sharp tools are economical tools. Keep them working for Victory!
NATIONAL
TWIST DRILL

But Here's a Break for American Industry!



Leading cutter and tool manufacturers are going all-out in producing for victory. You can keep those vital tools working with maximum speed and efficiency with the help of Covel's Yankee Twist Drill Grinder. Its "quick set-up" features save valuable time by eliminating complicated set-up methods. The Yankee swiftly and accurately grinds lips of twist drills of equal length and angles, both cutting and clearance, regardless of diameter, length, shape and helix angle of flute, straight or taper shank, two, three, or four lips. Yankee-ground drills cut faster, require less pressure, reduce reamer costs and tap breakage.

COVEL YANKEE TWIST DRILL GRINDER
Double End Combination for wet and dry grinding. Write, wire or phone today for details given in Bulletin A14.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

SELF-LUBRICATING BRONZE BEARINGS at 37 POINTS*...

AND PRECISION, PRELOADED BALL BEARING HEADSTOCK

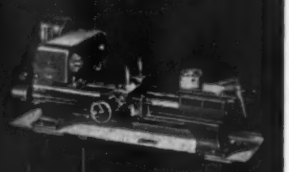
4 BEARINGS IN COUNTER-SHAFT
3 BEARINGS IN REVERSE GEAR BRACKET
11 BEARINGS IN GEAR BOX
6 BEARINGS IN HEADSTOCK
9 BEARINGS IN AUTOMATIC APRON
4 BEARINGS IN CARRIAGE ASSEMBLY

*Arrows indicate location and number of self-lubricating bearings in Logan Quick Change Gear Lathe. All Logan Lathes are similarly protected.

The day you install a Logan Lathe you end your worries about the constant oiling of vital parts. Take, for example, the Logan Quick Change Gear Lathe shown above. At 37 points where plain, oil-thirsty bearings are ordinarily furnished, this lathe gives you *self-lubricating bronze bearings.* Here is a feature of Logan advanced design which automatically eliminates a prime cause of breakdowns. Furthermore, the spindle on this and all Logan Lathes turns on precision, preloaded ball bearings that *never* need lubrication. This Logan combination of self-lubricating bronze bearings with precision, preloaded ball bearing spindle mounting forms another important reason why Logan Lathes are setting remarkable records for sustained accuracy . . . high speed, low cost production . . . longer machine life. Write today for the new catalog that gives you complete information on the advanced design features of all models of Logan Lathes.

Brief Specifications: . . . Swing over bed, 10½" . . . Between centers, 24" . . . Bed length, 43⅛" . . . Spindle hole, 25/32" . . . Precision ground ways: 2 prismatic V-ways; 2 flat ways . . . 12 spindle speeds, 30 to 1450 r.p.m.

Logan No. 200 Back Geared Screw Cutting Lathe with Self-Lubricating Bronze Bearings at 23 Points



Logan No. 850 Manufacturing Turret Lathe with Self-Lubricating Bronze Bearings at 19 Points

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

LOGAN ENGINEERING CO.

Chicago 30, Illinois

One of a series describing the finer features of Logan Lathes . . . Look for the next of the series

PROTECTION...

of Vital Production

of Vital Manpower

of Vital Time

BROACHING PRODUCTION FIGURES BASED ON ACTUAL SURVEY—

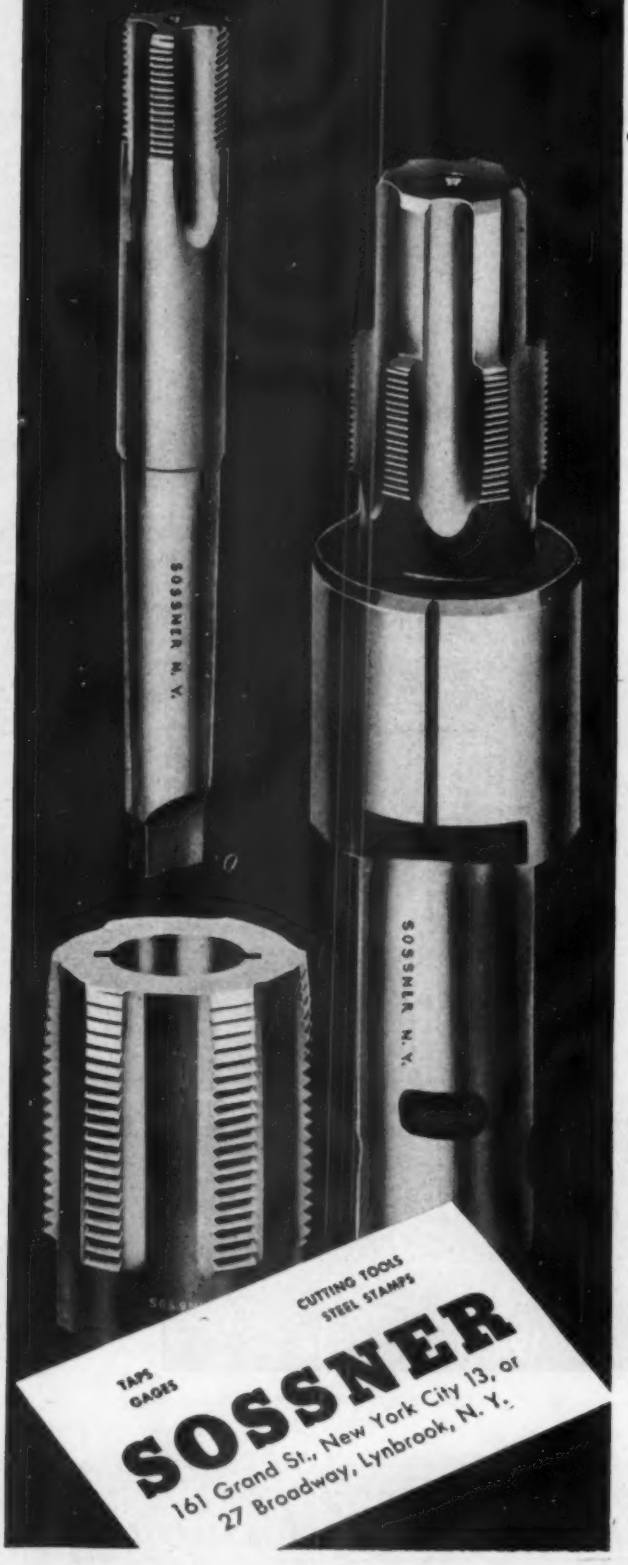
ARMY E NAVY

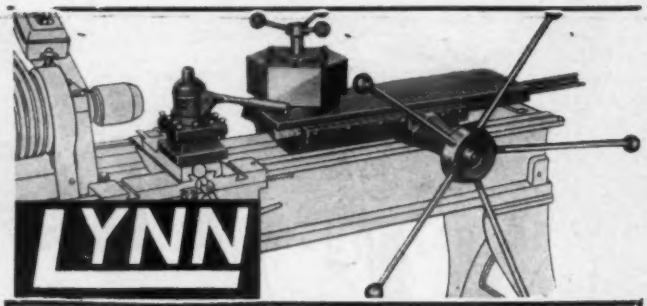
LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

33 YEARS OF PRECISION WORKMANSHIP, RELIABILITY, PERSONALIZED SERVICE

TAPS AND GAGES IN AMERICAN NATIONAL, BRITISH AND SPECIAL THREAD FORMS.





NEW NO. 3 LARGE BED TURRET

Converts Large Engine Lathes for Screw Machine and Turret Work

MEETS today's urgent need for quickly, economically *tooling up* present equipment for precision work and speedy production on varied items—long or short runs—with unskilled workers. Fits lathes up to 22" swing. 9½" hexagon head, 10" travel, easy-action large pilot wheel, 6 positions, automatic indexing of stops to each position. Designed to bore out to 1½" or less on your own lathe. Sturdy, heavy duty construction—engineered as carefully as finest turret lathes. *CUT-OFF CROSS SLIDE* available with back and front adjustable tool posts.

LYNN TOOL POST TURRETS—Self-indexing. For lathes with 12" to 28" swing. Holds 4 tools; indexes to 8 positions. Hardened indexing pin and inserts. No cams to wear. Solid steel blocks—sizes 5¼", 6½", 8". Working parts enclosed.

Distributed nationally by Jobbers
Write for full information.

LYNN MFG. CO., 224 Elroy St., Minneapolis 8, Minn.

NEED SUB-CONTRACTS?

Investigate the possibilities offered you through advertising in the CONTRACT WORK SECTION!

For details, write

CONTRACT WORK DEPT.

American Machinist **330 W. 42nd St., N. Y. C.**

WAR BONDS

are

WAR WEAPONS

★ ★ ★ ★

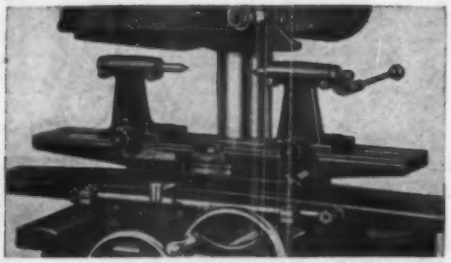
Invest to the limit!

Compact in design—sturdily constructed—foolproof in operation—this powerful DeWalt will *speed up* your cut-off operations not only in today's emergency but long after the war is over. Write for descriptive literature.

DE WALT
PRODUCTS CORPORATION
LANCASTER, PA.

1. As is . . it's a Surface Grinder

2. With the Univise . . it's a Chip-Breaker Grinder



3. With the Unihead . . it's a Tool & Cutter Grinder

DELTA
MILWAUKEE
Machine Tools

DRILL PRESSES—GRINDERS — CUT-OFF MACHINES — BAND SAWS ABRASIVE FINISHING MACHINES

Delta *now offers you . . .*

3 accurate, dependable grinders

Any one of these combinations — by itself — is "a heck of a lot of machine for the money". But take all three together, and you have a saving that no shop, large or small, can afford to overlook.

As a surface grinder, it's a husky, big-capacity machine — over 6 ft. high, weighs close to 700 lbs., grinds surfaces up to 13½" long, 6" wide. Designed for ease and speed of operation—with convenient controls, wide graduations on micrometer for close settings, many other latest features for accuracy and dependability.

As a Chip-Breaker Grinder, it gives exceptionally accurate results in grinding the chip-breaker groove on carbide-tipped tools. Equipped with the Univise, which holds the tool at any conceivable angle, may be reset at *precisely* the same angles as original setting without bothersome and often inaccurate measurements.

As a Tool & Cutter Grinder, it makes tool sharpening simpler, easier, cheaper, and extremely accurate. With the Unihead attachment, almost any conceivable angle can be ground.

For a real find that gives creditable results for years, investigate this modern, safe, good-looking machine. Consult your Delta industrial distributor (Delta sells only through distributors) or write for new bulletins. M-8

Specifications

Wheels must have 1¼" hole.
Table surface 5¾ x 13".
Traverse feed, one graduation is .001"
Micrometer adjustment ⅜" range, each graduation is .0005"
Spindle speeds (with 60 cy. 1750 R.P.M. motor) 3200 and 4200 R.P.M.

No. 24-105 Surface Grinder	$295.00
No. 24-205 Chip Breaker Grinder	343.50
No. 24-305 Tool & Cutter Grinder	370.00

Priority required, A-1-A or better, under restrictions of Limitations Order L-237.

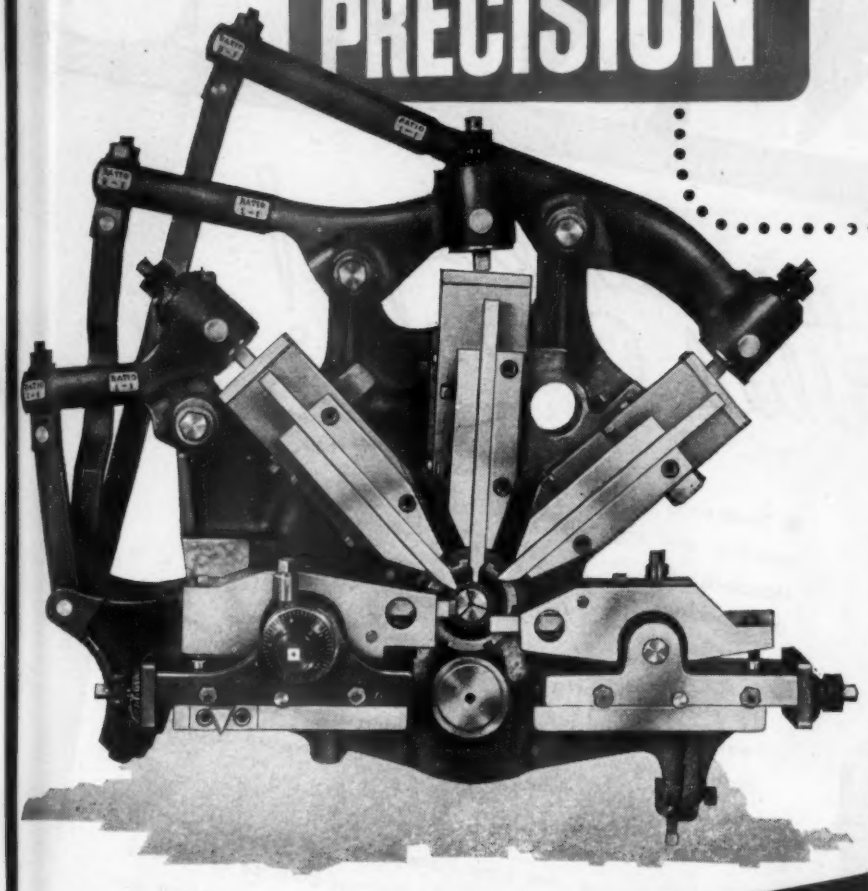
TEAR OUT AND MAIL COUPON TODAY

THE DELTA MANUFACTURING CO.
609A E. Vienna Ave., Milwaukee 1, Wis.

Please send me your catalog and bulletins describing the Delta 3-in-1 grinder combination.

Name.....Position.....
Company.....
Address.....
City.....(.....) State.....

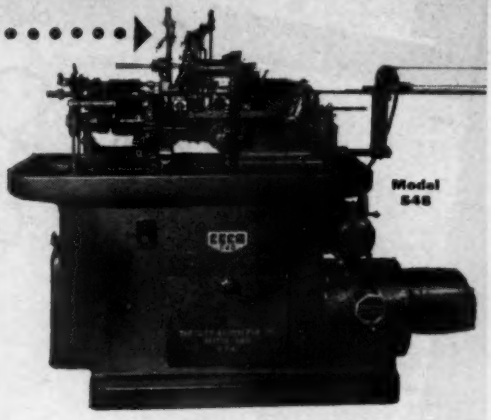
One-Operation PRECISION



CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES



Highlight Features!

BAR CAPACITY: ⅜" and ½"

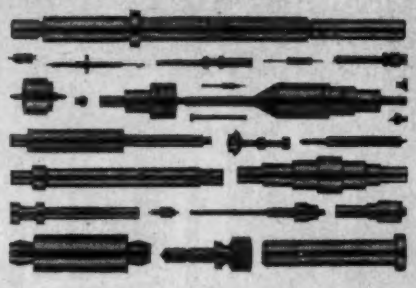
4 or 5 RADIAL TOOL SLIDES.

MAXIMUM TURNING LENGTH: 4" with flat cam.

MASTER SPEED RANGER: Varies Spindle speed from 675 to 7500 R.P.M. at the turn of a handwheel.

PRECISION ROLLER BEARING SPINDLE: Always in adjustment.

CONSTANT RISE FEEDING MECHANISM gives extreme feeding accuracy.



Serving some of America's greatest precision-makers, including Norden, Kollsman, Sperry, Bendix and many others, the Ceco Automatic is revolutionizing the mass production of small intricate parts—cutting tool costs, speeding the set-up and producing *one-operation precision work* with amazing economy and efficiency.

THIS BOMBSIGHT PINION SHAFT
IS AN EXAMPLE OF CECO'S
ONE-OPERATION, HIGH-SPEED PRECISION PRODUCTION

Produced by Ceco *in one operation* instead of three formerly required, and with single tip tooling, thereby eliminating form tools commonly used, is the Bombsight part reproduced above.

Shown on this page are a few of the hundreds of parts Ceco produced in *one operation* with extreme accuracy and high finish. Odd shapes and multiple diameters, also complicated forms, including tapers, bevels, radii, etc., are Ceco-produced with single tip tools. Result—quick set-up, low cost, and faster high precision production of intricate parts. For information and literature write:

THE CITY ENGINEERING CO.
DAYTON, OHIO

Since 1909, Designers and Builders of Tools, Dies, Jigs, Fixtures, Gages and Special Machinery.

BAKER

Drills Superchargers for Allied Aircraft!

● Illustrated here is another example of BAKER craftsmanship and ingenuity . . . a special adaptation of a standard BAKER Model 36-HO, featuring a unique arrangement for multiple-drilling operations on aircraft superchargers.

The machine is arranged with a 35-spindle fixed center head and special holding fixtures mounted on the machine base. Note the tool support bushing plate carried from the head of the machine . . . also the universal-arranged fixture for chucking.

BAKER units of this type have been installed in aircraft engine building plants for the express purpose of increasing production without sacrificing any of the extreme accuracy required in the construction of aircraft engines.

Important too is the extreme flexibility of this type of equipment. After Victory the 36-HO can easily be retooled and employed in peace-time production.

Contact BAKER today for specialized engineering aid. Whether your need is for special or standard drilling, boring or tapping machines, BAKER can supply the equipment!

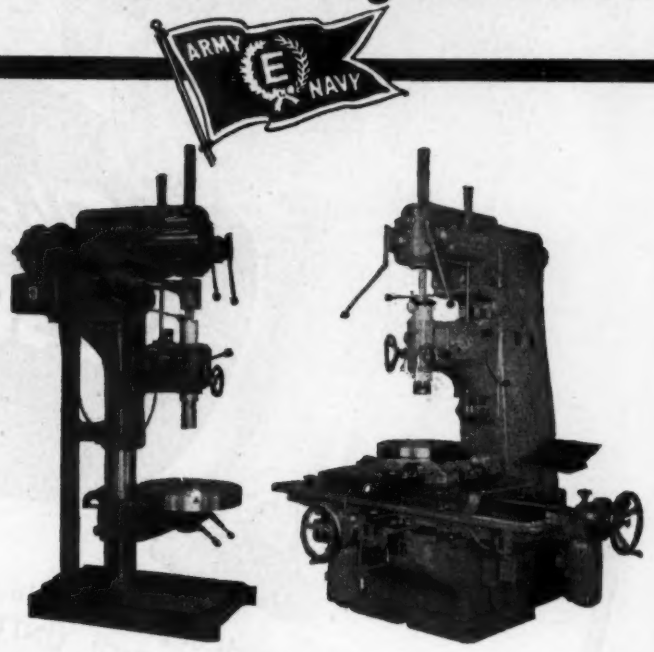
Our Motto Since 1867: "Machines Sturdy and efficient, as Fine as Can Be Built."

BAKER BROTHERS, INC.
TOLEDO . . OHIO . . U.S.A.
DRILLING . BORING . TAPPING

Cleereman

Jig Borers and Drilling Machines

All control movements on Cleereman machines are made from the operator's position.



The Cleereman Jig Borer spindle control is conveniently mounted on the front of the base.

"Cleereman Controls Increase Output"

Correct speeds, increased output, and minimum operator effort are the results of convenient grouping and ease of operation of controls on *Cleereman* machines. Single lever selectors for speeds and feeds, binder levers, hand wheels, clutch levers, and the start-stop-reverse lever—are all easily reached from the operator's normal working position.

Added to this control feature, Cleereman machines also offer extreme range of adaptability, unexcelled accuracy, high speed production, and long working life.

Write for the new Cleereman Jig Borer and Drilling Machine catalogs!

BRYANT MACHINERY & ENGINEERING COMPANY

Associated with **CLEEREMAN MACHINE TOOL COMPANY**

General Sales Offices 400 W. Madison St. • • Chicago • Ill. • U.S.A.

The LIFE SAVER

Acclaimed in hundreds of production lines, the NORGREN LUBRO-CONTROL UNIT holds a record second to none for extending the life of air tools. Wherever air is used in industry, the Norgren Lubro-Control Unit filters, regulates and oils the air that powers machine or air tool. Eliminates rough, bucking performance. Checks wear and tear. Stops corrosion. A real life saver; automatic, starts and stops with the tool.

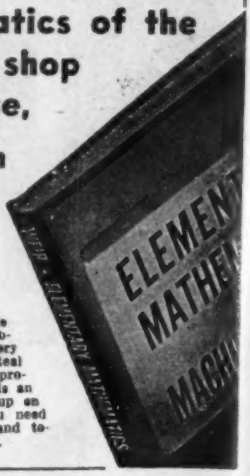
For complete information, write to C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colo.

Norgren

GET CATALOG 400

Now — the essential mathematics of the machine shop *in concise,* simple form

Just out!



Don't let the simple mathematical problems you meet every day in your work steal precious minutes of production time. Here is an easy way to brush up on the mathematics you need—a simple, brief, and to-the-point math book.

This book includes all the elemental mathematics the average machinist needs, giving only that work which is of prime importance leaving out non-essentials. Starting at the very beginning with arithmetic, it takes you through enough algebra, geometry, and trigonometry to handle shop work successfully. Emphasis is on the jobs you meet daily in your work—calculations of cutting speeds, reading measuring tools, calculations involved in everyday use of machine tools. Practice problems are taken right from the machine shop.

ELEMENTARY MATHEMATICS FOR THE MACHINE TRADES

By John J. Weir
Instructor,
Sperry Gyroscope Co

185 pages, 5½ x 8, 121 illustrations, many tables, $2.00

For a quick refresher home-study course in machine shop math, these 15 progressive, easy-to-grasp lessons are what you need.

1. Fundamental Operations
2. Fractions
3. Decimals
4. Squares, Cubes, Square Root
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10. The Lathe
11. Screw Threads
12. Shaper, Planer, Drill Press, Grinder, and Milling Machine
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Look up these many explanations

—addition; subtraction; multiplication; division
—combining operations
—use of fractions; the steel rule
—use of decimals
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—measuring; the micrometer; the height gage and vernier caliper; graduated dials
—squaring and cubing a number
—stating rules as formulas
—using formulas
—the bevel protractor; using angles
—cutting circles from squares and squares from circles
—ratio; proportion
—direct and inverse proportion
—percentage
—speed of pulleys; pulley trains
—belt lengths; rotation of pulleys
—gear trains; speed relations of simple and compound gear trains
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—feed and speed
—taper turning; angle turning
etc., etc., etc.

Let this simple home-study course help you on the job 10 days free

SEND THIS ON-APPROVAL COUPON

McGraw-Hill Book Co., 330 W. 42 St., New York 18, N.Y.

Send me Weir's Elementary Mathematics for the Machine Trades for 10 days' examination on approval. In 10 days I will send $2.00, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

Name _____

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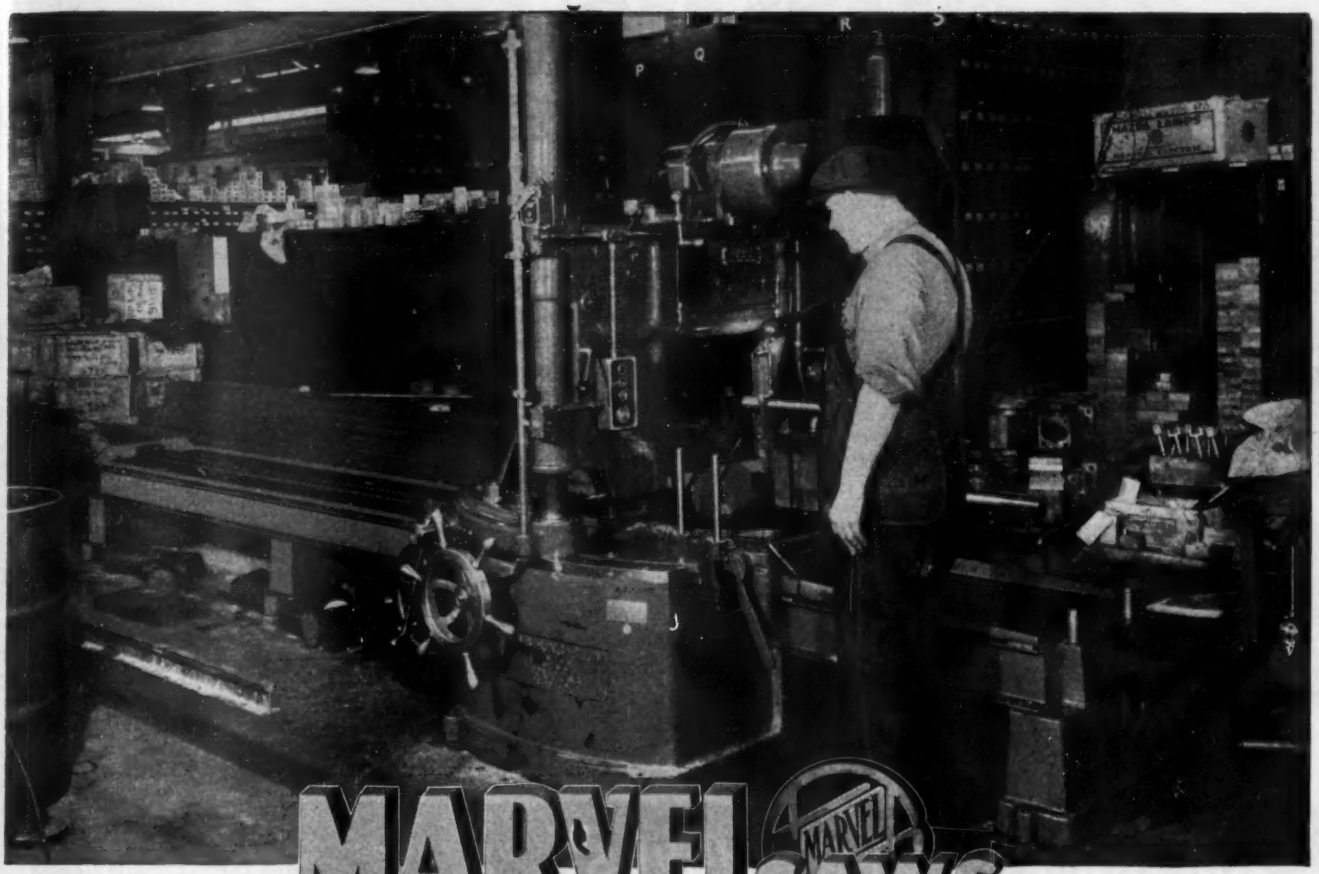
Position _____

Company _____ FA—1-8-44



MARVEL SAWS

Cuts Two 6" dia. Gear Blanks every 11 minutes

There are 12 MARVEL Saws at the Northern Pump Co., Minneapolis, some of which are in their tenth year of service. The Giant Hydraulic No. 18 MARVEL pictured above is a comparative newcomer in the Northern MARVEL family, having been installed just 3 months ago, to speed up production on large work. When pictured, it was cutting-off gear blanks from 6" dia. S.A.E. 3120 hot rolled steel, two at a time, cutting-off two blanks every 11 minutes.

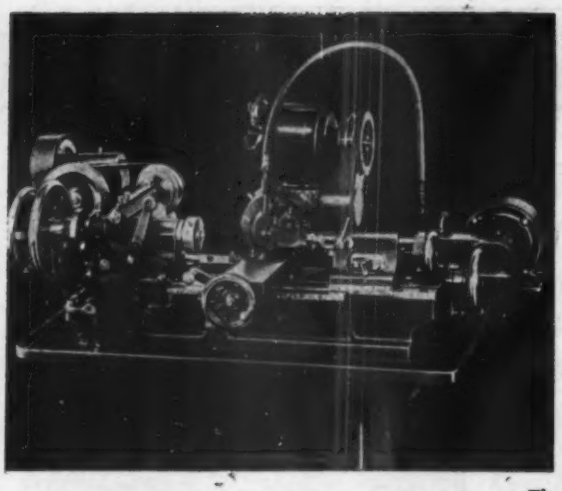
Whether you want thin slices or long lengths cut-off from flat or round bars, MARVEL Saws will produce more pieces per hour and will cut them off at lower cost per piece than any other machine or cutting-off method. Included in the MARVEL System are small inexpensive dry-cutting shop saws; heavy duty all-ball-bearing high speed hack saws (the fastest saws built); automatic production sawing machines that require no more operator attention than an automatic screw machine; a metal-cutting band saw that saves hours of machining, roughing to size and shape; and a Giant Hydraulic Hack Saw, that cuts the toughest steel with ease. MARVEL High-Speed-Edge Hack Saw Blades are positively unbreakable, can be safely operated at maximum speed and feed on any hack sawing machine.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. Chicago, U.S.A.

Eastern Sales: 225 Lafayette St., New York



WALTHAM THREAD MILLERS

are time-savers in the production of precision threads

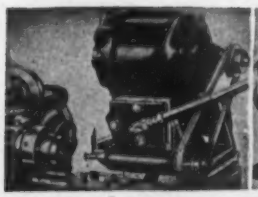
Whether for tool room or the production requirements of standard or other thread forms, these sturdy improved machines can be depended on for high production and accuracy. Their versatility is practically unlimited because with the cutters available not only standard threads but also special forms including V, N, Whitworth, Buttress, etc., can be produced with utmost convenience and precision. Work up to 3" in diameter can be handled although 2" or less in diameter is recommended.

These machines feature three motors which provide individual and wide speed change and reverse for cutter and work. Pump is operated at constant speed. Greater rigidity of cutter head is another feature in improved design.

Standard equipment includes push button control, automatic stop, follow rest, one milling cutter, indexing device, 5 pitch lead screw and 13 change gears for cutting from 5 to 40 threads per inch.

Extra equipment available include: taper attachments, gears for cutting metric threads, metric lead screw, relieving attachment, special heads for internal and multiple thread cutting, and automatic cam operation.

Full and complete details available promptly on request.



Machine equipped with Internal Threading Attachment having special motor driven cutter head.

Machine equipped with Relieving Attachment. A special work head replaces lead screw.

WALTHAM MACHINE WORKS WALTHAM MASS. WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

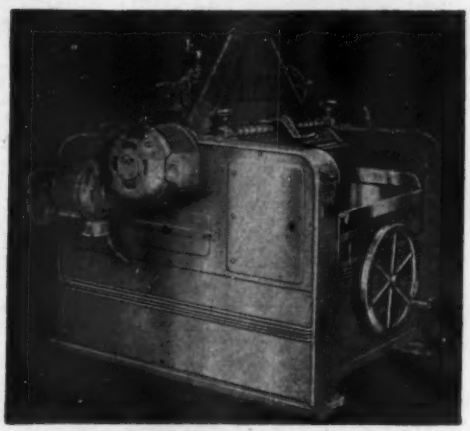
SUPPLIED IN ANY DESIRED MATERIAL

DETROIT BEVEL GEAR COMPANY

8130 JOS. CAMPAU AVE.
DETROIT, MICH.

Makers of Quality Gears for 30 Years

BUSS *Wood Surfacers*



GIVE YOU THE ABSOLUTE PRECISION ESSENTIAL IN PATTERN and JIG MAKING!

—plus faster changeover, greater convenience of operation and the assurance of years of perfect service. Write for Bulletin Type 4-L showing the many patented features which make this the finest of all surfacers for pattern and jig departments. Production Models to suit every circumstance. We specialize in surfacers.

BUSS MACHINE WORKS
228 EIGHTH STREET HOLLAND, MICH.

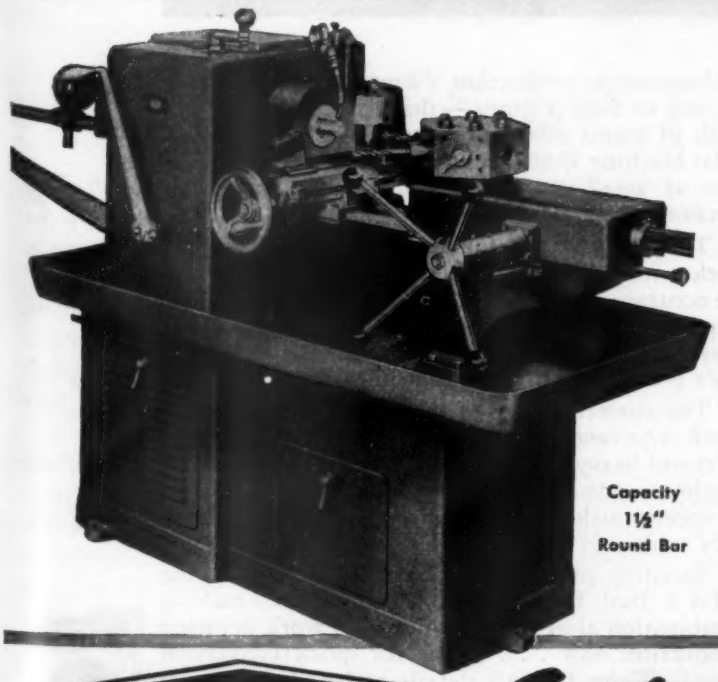
SIMPLICITY + ADAPTABILITY

OSTER

No. 601

"Rapiduction"

BAR AND CHUCKING MACHINE



Capacity 1½" Round Bar

SIMPLICITY of the Oster No. 601 *"Rapiduction"* makes possible fast training of women with little or no prior experience as machine operators.

ADAPTABILITY of the Oster No. 601 *"Rapiduction"* makes it possible to meet individual requirements economically. For example, in the shop department illustrated, the machine at left is equipped with automatically indexed, six-station turret for a sequence of operations; the machine in the center has a plain carriage and single tool post; the operator at the right uses the machine with no carriage, as illustrated.

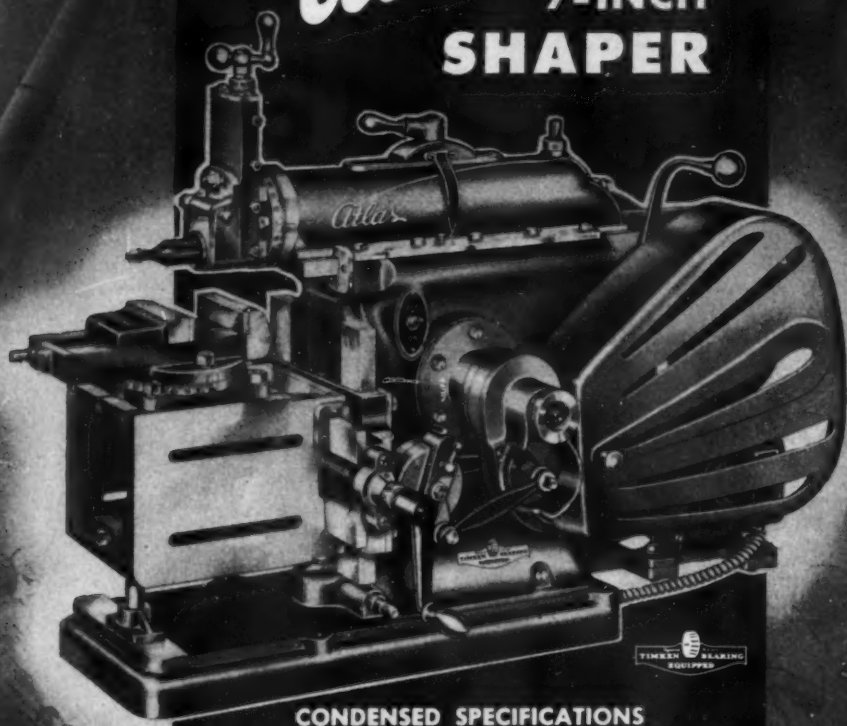
For making extremely heavy forming cuts, the Oster No. 601 *"Rapiduction"* is furnished with the WORM DRIVE. For high spindle speeds up to 3000 rpm as well as for machining non-ferrous metals, the DIRECT DRIVE is furnished.

Catalog No. 27-B gives complete data. *Ask for it!* An Oster Distributor is near you for prompt cooperation.

THE OSTER MANUFACTURING COMPANY
2049 East 61st Street • Cleveland 3, Ohio, U. S. A.

OSTER *Cuts Your Costs!*

Atlas 7-INCH SHAPER



CONDENSED SPECIFICATIONS

Ram Stroke	½" to 7"
Strokes per Minute	45, 78, 122, 186
Cutting Speeds	3½ to 116 fpm
Table Travel, horizontal	9⅜"
Table Travel, vertical	4⅞"
Overall Dimensions	36" x 17" x 26" high

Crank-type bull-gear drive, complete V-belt drive, 5 automatic cross feeds, Timken tapered roller bearings, integral countershaft, built-in on-off motor control switch.

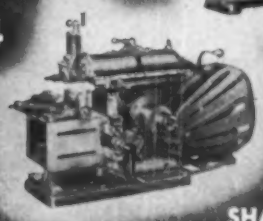
Atlas 4 TOOL TEAM FOR SMALL-PARTS MACHINING

1 LATHES

2 MILLING MACHINES

3 DRILL PRESSES

4 SHAPERS



Increasing production "firepower" — speeding the day of total Victory — that's the story in thousands of plants where production engineers specify Atlas Machine Tools, *the tools that take over production of small parts so that capacities of larger machines will not be wasted.*

The Atlas Shaper, for example, does all shaping work within a seven inch stroke . . . does it with the accuracy, power, and strength of larger machines. Angular, vertical, horizontal and V-cuts, dovetailing, keyseating, and internal operations are all in the day's production for this rugged compact machine.

The modern design of the Atlas Shaper plus the *crank-type ram driving mechanism powered by V-belts* and heavy-duty Timken bearings that transmit maximum power to the ram with smooth action at all speeds, make it possible to operate at full efficiency with a ½ HP motor.

Speeding production for a quicker Victory, the Atlas 4 Tool Team will be a potent profit-making combination after the war. Put it to work boosting production now . . . use it for quick conversion later! Write for full details and address of our nearest representative.

ATLAS PRESS COMPANY

104 NORTH PITCHER STREET, KALAMAZOO 13D, MICHIGAN

STARTING JANUARY 18TH

IT'S UP TO YOU!

STARTING January 18th, it's up to you to lead the men and women working in your plant to do themselves proud by helping to put over the 4th War Loan.

Your Government picks you for this job because you are better fitted than anyone else to know what your employees can and should do—and you're their natural leader. This time, your Government asks your plant to meet a definite quota—and to break it, *plenty!*

If your plant quota has not yet been set, get in touch now with your State Chairman of the War Finance Committee.

To meet your plant quota, will mean that you will have to hold your present Pay-Roll Deduction Plan payments at their peak figure—*and then get at least an average of one EXTRA $100 bond from every worker!*

That's where your leadership comes in—and the leadership of every one of your associates, from plant superintendent to foreman! It's your job to see that your fellow workers are sold the finest investment in the world. To see that they buy their share of tomorrow—of Victory!

That won't prove difficult, if you organize for it. Set up your own campaign right now—and don't aim for anything less than a 100% record in those *extra* $100 bonds!

And here's one last thought. Forget you ever heard of "10%" as a measure of a reasonable investment in War Bonds under the Pay-Roll Deduction Plan. Today, thousands of families that formerly depended upon a single wage earner now enjoy the earnings of several. In such cases, 10% or 15% represents but a paltry fraction of an investment which should reach 25%, 50%, or more!

Now then—Up and At Them!

***Keep Backing the Attack!*—WITH WAR BONDS**

This space contributed to Victory by **AMERICAN MACHINIST**

This advertisement prepared under the auspices of the United States Treasury Department and the War Advertising Council

SHAPING *in addition to* MILLING, DRILLING *and* BORING . . . *now available on*

Bridgeport

TURRET MILLING MACHINES

The new Bridgeport Shaping Attachment adds an extra feature which makes these machines capable of almost unlimited utility. Design is such that this new attachment can be mounted not only on existing Bridgeport Turret Milling Machines (shown here on back end of overarm) but also on other types of milling machines and special production equipment. Shaping operations can be performed at all angles making this attachment fast, and practical on die and mold work of all kinds as well as for intricate slotting on production jobs. The Bridgeport Shaping Attachment is now in production and is available promptly.

Investigate This Versatile Machine

The Bridgeport Turret Milling Machine with High Speed Milling Attachment handles milling, drilling and boring at all angles with maximum ease and convenience. It can be depended on for accuracy and speed on a wide range of work. It is sturdy and powerful—a precision machine for production demands.
Features of the machine include: 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

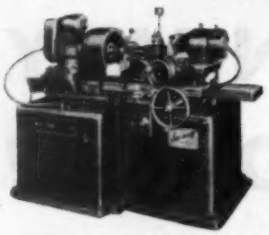
Bridgeport High Speed Milling Attachments are available as separate units (¼ HP and ½ HP) for use on other types of milling machines and production equipment. They are extensively used in all branches of the metal working industry and making a valuable contribution to war production.

Write for Illustrated Bulletins giving complete detailed information on Bridgeport Turret Milling Machines and Bridgeport Shaping and High Speed Milling Attachments.

THE BRIDGEPORT MACHINES, INC., *Bridgeport, Conn.*

The *Sav-way* M-H-2 Internal Grinder

Combines Hand and Hydraulic Operation



Neoprene Insulated Against Vibration

For the first time in one machine, all the advantages of hand and hydraulic table operation! The bed is insulated from the base by neoprene pads, which prevent floor vibration and distortion of the base from being transmitted to the bed. Equipped with the famous Sav-Way Gold Seal Spindle—the spindle that breathes! Seventeen exclusive features.

This machine is setting production records in 'round-the-clock wartime operation.

Send the Coupon for Illustrated Literature

Sav-way INDUSTRIES • DETROIT
Machine Tool Division

Sav-Way Industries, Box 117, Harper Station, Detroit 13, Mich.
Please send descriptive literature covering the Sav-Way M-H-2 Grinder.

Name_____
Firm_____
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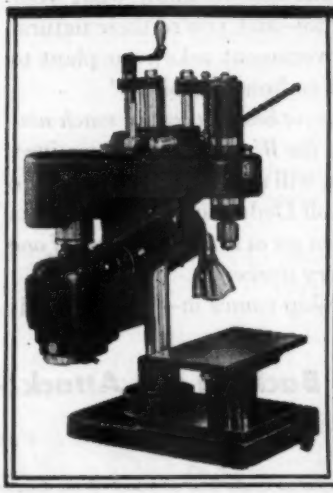
Sensitive DRILLING MACHINES *Avey*

CINCINNATI OHIO

ROCKFORD MACHINE TOOL CO.

Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers
— ROCKFORD, ILLINOIS, U. S. A. —



HAMILTON-MUEHLMATT "VARIMATIC"

offers a wide range of super sensitive drilling speeds

The wide range of drilling speeds provided in the "Varimatic" makes it adaptable for the finest of tool room work, instrument, diesel, electrical, airplane and similar precision work. It is built to "instrument precision" and has a capacity for drills from .004" to 5/16" inclusive. Speed Ranges as follows—Low Range—Minimum 840—Maximum 2700—High Range—Minimum 2900—Maximum 9300. Write for details.

The Hamilton Tool Co.
HAMILTON OHIO

ractical Boring to Limits Like This:

+.0002" −.0001"

PRECISION BORING DATA

PART—End Bracket.

MATERIAL—Cast Aluminum with 1020 Steel Insert.

HOLDING METHOD—Special Fixture.

LOCATION—On Rabbit Fit Dia.

MACHINE—#200 Simplex Precision Boring Machine.

OPERATION—Bore 1.0230" Dia. Hole.

TOLERANCES—+.0002", −.0001".

FEED—1⅞" per Minute.

SPEED—1150 r.p.m.

FLOOR-TO-FLOOR TIME—4 Minutes, including inspection time.

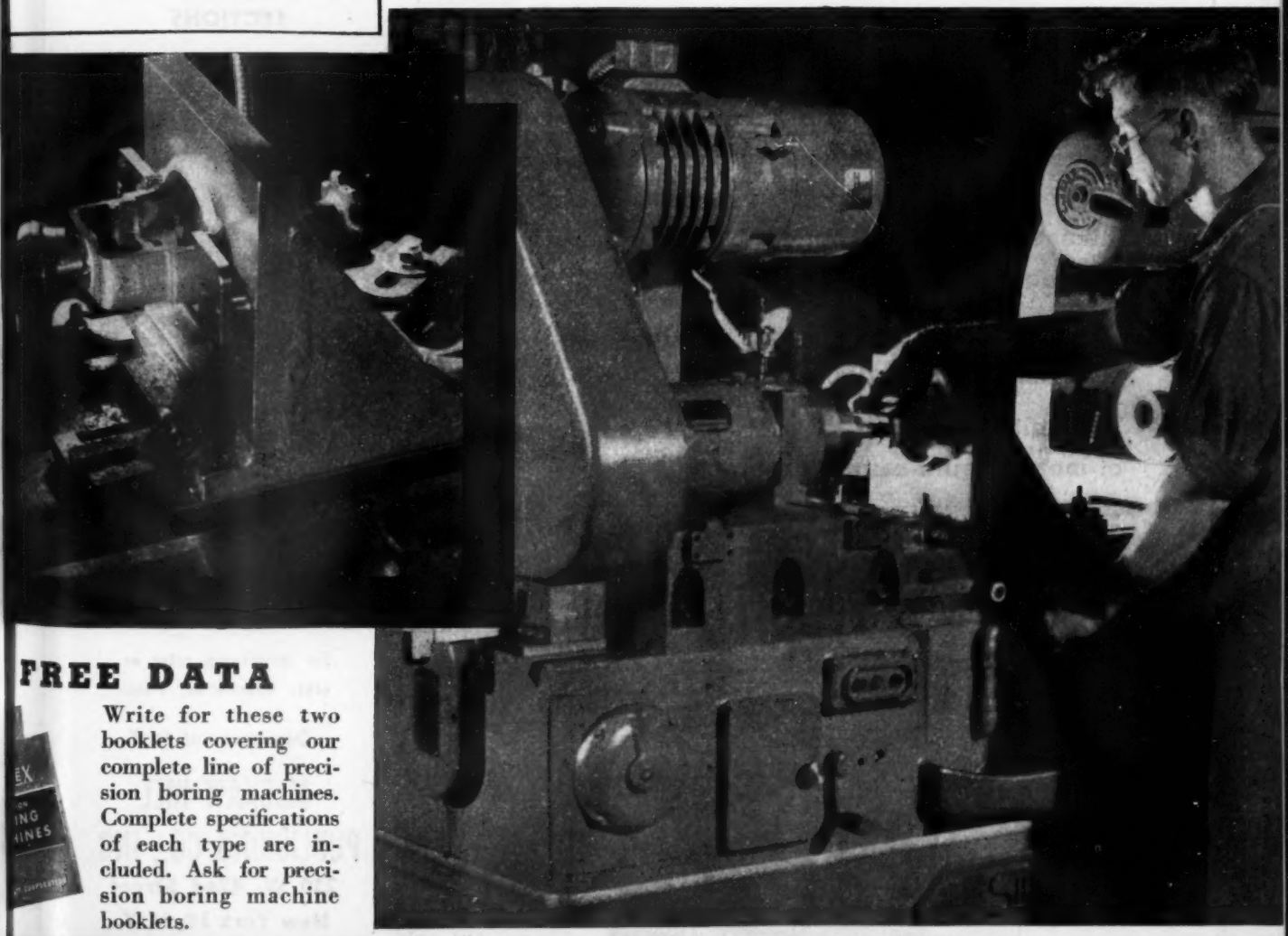
SIMPLEX UNIT-TYPE BORING MACHINES OFFER *Precision, Versatility and Speed*

This Simplex Precision Boring Machine is designed for plants having a number of jobs of varying types to be handled by one machine. The bridges are made so they can be easily adjusted to suit the part being machined. A built-in electric facing control is provided with adjustable dwell.

END BRACKET PRECISION BORED IN 50 SECONDS

In this installation, an end bracket bore is machined to 1.0230" (+.0002", −.0001"). Boring Time is only 50 seconds. Finish is very smooth, and approximately 100 brackets are machined per tool sharpening.

Perhaps one of our 25 different basic models of Simplex Precision Boring Machines will serve you as well. Our engineers will be glad to make a study of your parts and production for faster and better precision boring. Send your part prints and production figures . . . no obligation.



FREE DATA

Write for these two booklets covering our complete line of precision boring machines. Complete specifications of each type are included. Ask for precision boring machine booklets.

STOKERUNIT CORPORATION

GNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES

4524 WEST MITCHELL STREET · MILWAUKEE, WISCONSIN

INDUSTRY SAYS "TOPS"

MANY FEATURES COMBINE TO MAKE THIS

PIONEER

MODEL VBD

AN OUTSTANDING PUMP

Provided with three pipe tapped outlets (right, left, and back into coolant sump), this Pioneer Pump model offers you great flexibility. It reduces your stock inventory; you don't have to carry a variety of pump models to satisfy the need for different outlets. One model is all you require.

This model will pump liquids usually considered difficult to handle, such as abrasives, etc.

The unit is designed to assure safe operation of motor; liquid cannot affect it.

These are a few of the high spots that distinguish the Model VBD—real efficiency from top to bottom of its streamlined body.

Pioneer Pump & Manufacturing Company
19651 John R Street, Detroit 3, Michigan

PIONEER *Pumps*

HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

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McGRAW-HILL PUBLISHING CO., INC.
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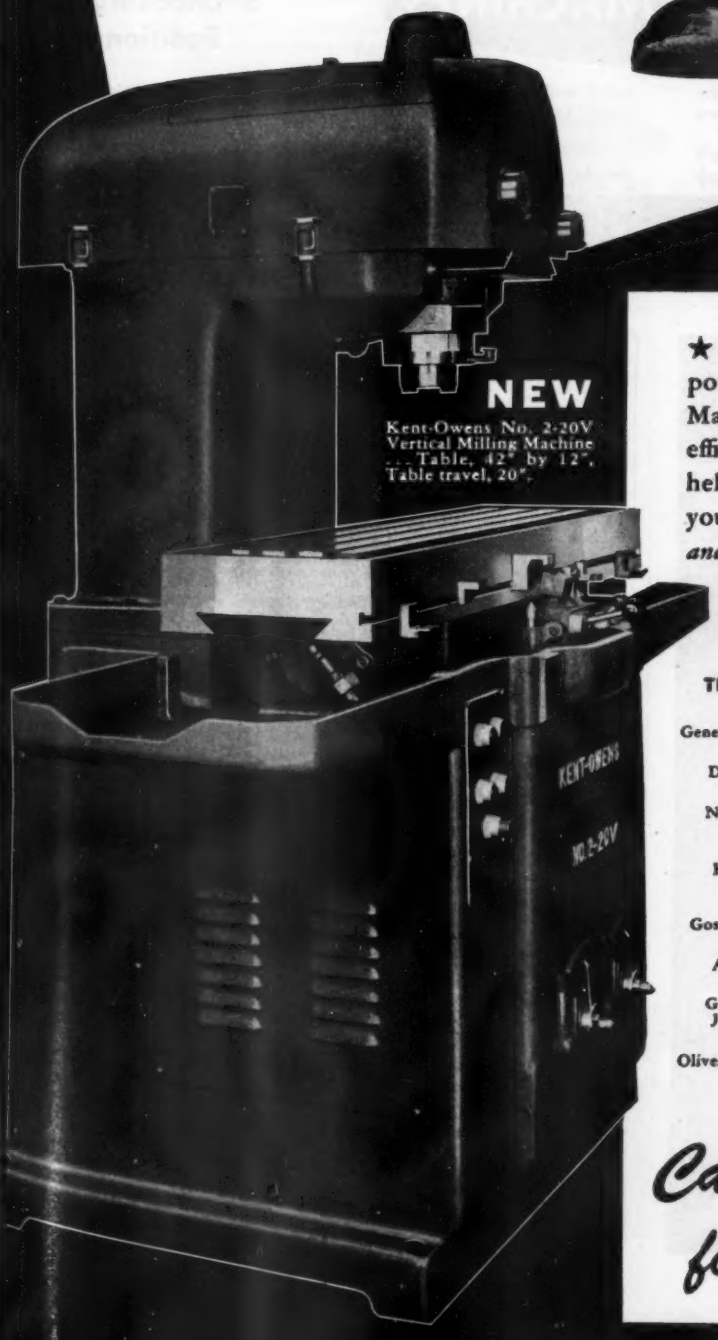
She can fill his shoes better on milling jobs...

with **KENT-OWENS MACHINES!**



★ For a better use of manpower and WOMAN-power... you can't beat KENT-OWENS Milling Machines! They're the *right* answer for simple, efficient, practical operation that's easy for green help to master. Ruggedly built... designed to help you meet RUSH war schedules with greater *speed and accuracy* in your production. Send for latest bulletins.

Kent-Owens Machine Company, Toledo, Ohio.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

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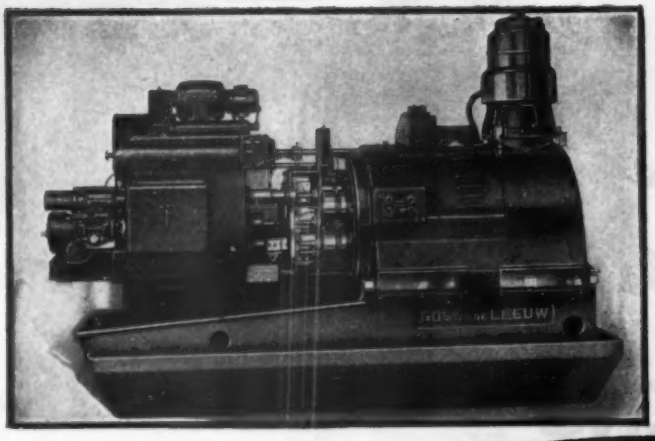
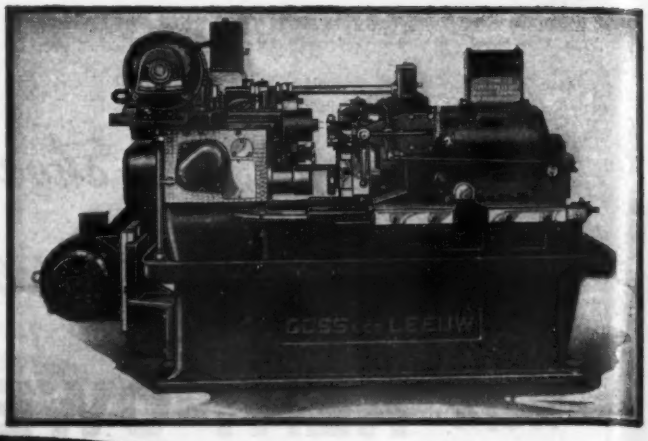




WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

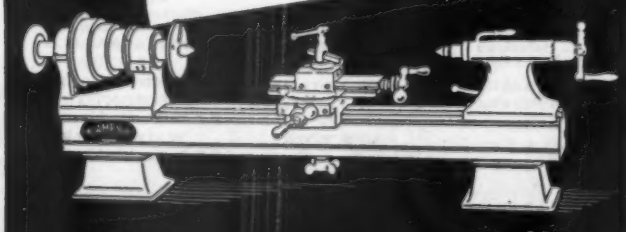
Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

AMES *Precision* BENCH LATHE

Known for 40 years as a precision lathe of the highest quality. Bed 36" long. Ball bearing headstock uses 1" capacity collets. Swing 8⅜" over bed. Available with motor drive.

Send For Catalog



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TOOL IMPROVEMENTS CO.

TELEPHONE WANTAGH 48

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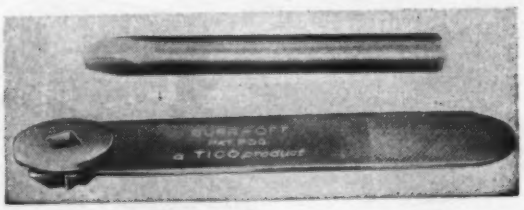
MANUFACTURERS OF SPECIAL TOOLS AND EQUIPMENT

NEWBRIDGE ROAD BELLMORE - LONG ISLAND NEW YORK



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A NEW TOOL

called the

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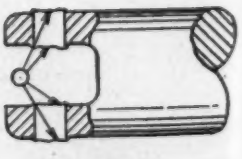
FOR BURRING AND CHAMFERING THE SHARP CORNERS ON PARTS LIKE THESE →



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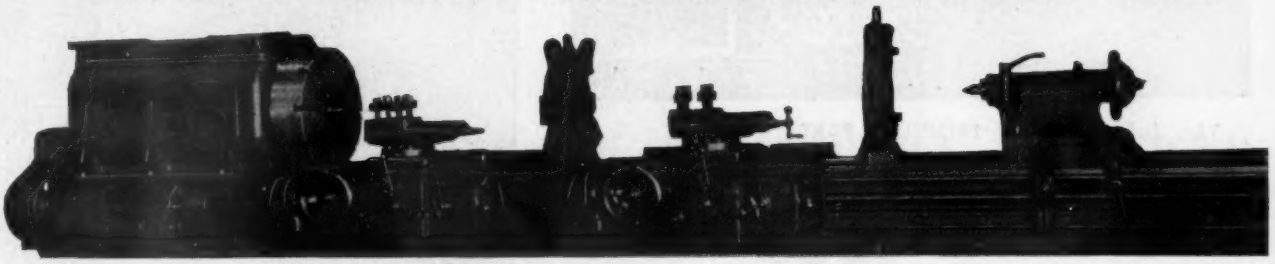
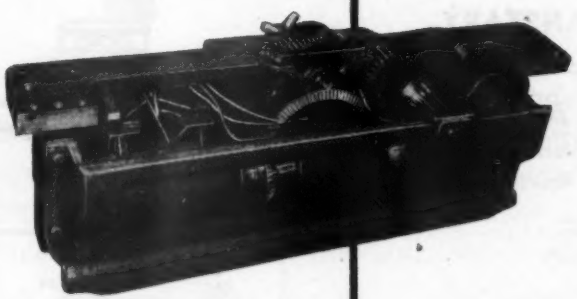
Sommerfeld

HEAVY-DUTY 36" LATHES

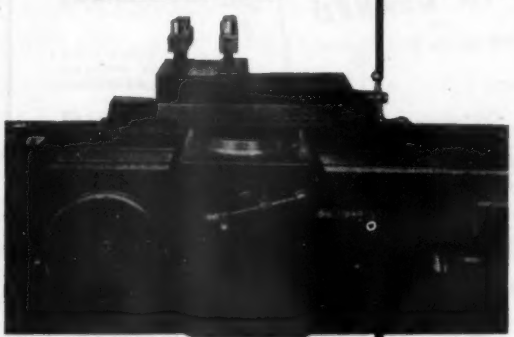
FOR BORING AND TURNING OR TURNING ONLY



Type T (Turning Only) Sommerfeld Lathe—36 inch Heavy Duty.



Double wall construction of the Apron reduces strain on gears and studs when feeding.



Compound Rest is heavy and rigid, with a long, broad bearing on the carriage.

The Boring Bar Saddle, actuated by the boring screw, operates the boring bar.

For heavy duty, large diameter turning and boring, Sommerfeld Machine Company offers 37 inch and 42 inch lathes, in any bed-lengths. Made in two types—one for turning only, the other for both boring and turning. The Boring & Turning Lathes will simultaneously turn the outside of a piece and bore the inside. These operations are performed independently, as the Carriage is driven by the Lead Screw, and the Boring Bar Saddle by the Boring Screw. These drives operate at different speeds, with the Boring Screw turning approximately one-sixth as fast as the Lead Screw. This assures adequate feed for the turning operations after setting for proper boring feed.

The Turning Lathes perform all customary roughing, finishing and thread-cutting operations. All Sommerfeld Lathes are guaranteed to meet the specifications published in the American Standards Association's "Accuracy of Engine Lathes" November, 1941.

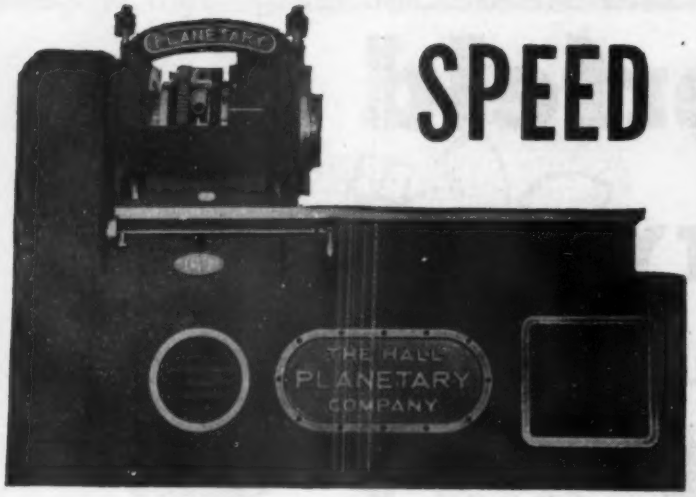
Sommerfeld

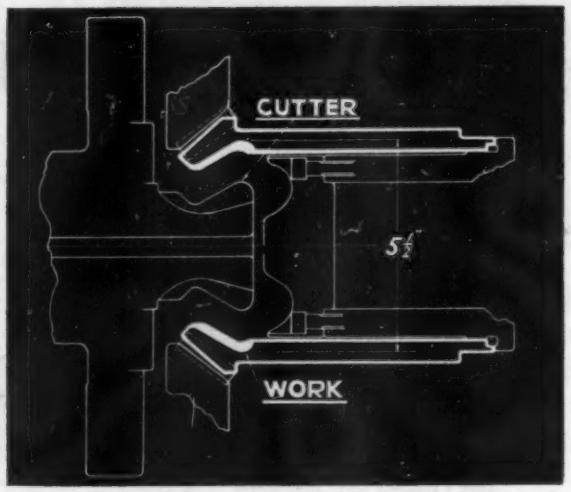
MACHINE COMPANY

BRADDOCK, PA.

Makers of Machine Tools since 1895

SPEED and EFFICIENCY





The Job: AIRPLANE PROPELLER PART

The Material: VERY TOUGH, HARD STEEL

The Time: COMPLETE CYCLE APPROXIMATELY 5 MINUTES

Locating is taken from Pitch Diameter of gear teeth on Face of work.

The Machine: **THE HALL PLANETARY**

HALL PLANETARY CO.

Fox Street and Abbotsford Avenue, Philadelphia

Complete Information upon Request

MOREY TURRET LATHES

for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

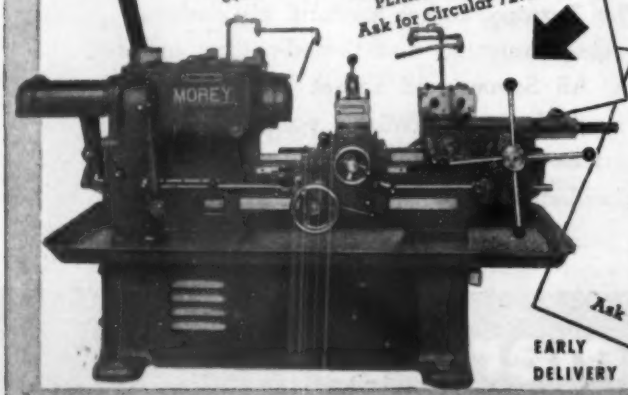
2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY



INFINITE SPINDLE SPEEDS —Electrically Selected—

DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).

GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.

SPINDLE MOUNTED ON TIMKEN BEARINGS.

RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.

SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

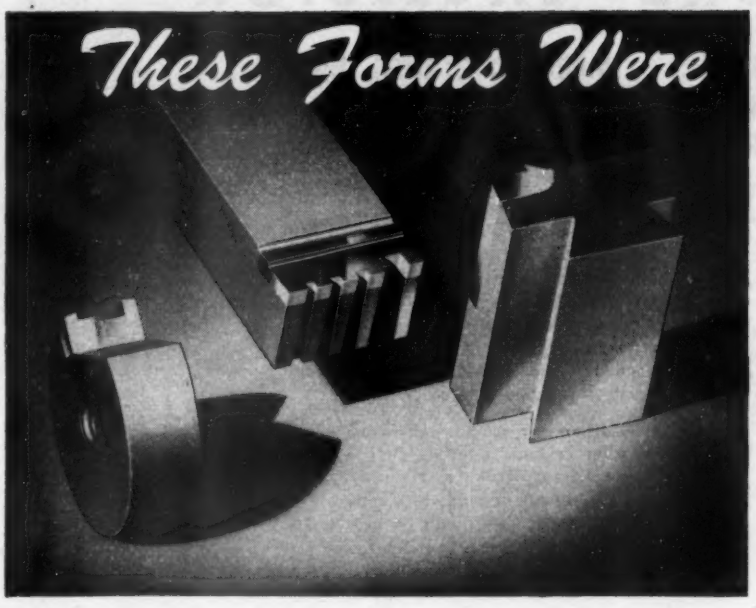
ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY

MOREY MACHINERY CO., INC

410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK



FINISH GROUND

From The Rough

and Checked

In One Setting

WITHOUT REMOVAL

From the

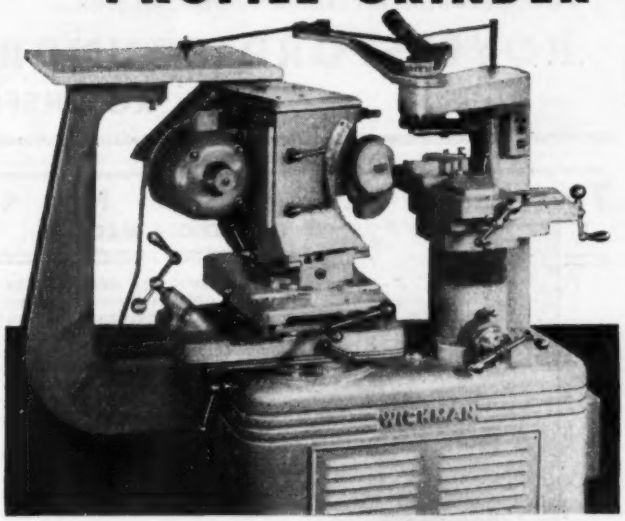
Wickman

PROFILE GRINDER

THE Wickman Profile Grinder provides a method of grinding in which a fifty times size layout of the form, a pantograph system, microscopic inspection, and a universal grinder are coordinated to provide profile grinding to an accuracy within ±.0005". Because of the extremely accurate method by which the profile is transferred directly from the drawing to the part, no further inspection or checking of the part is necessary. Before the part is removed from the machine, the profile which was ground is known to be correct.

In the grinding of a wide range of regular or irregular shapes including those ground in tungsten-carbide, the Wickman Profile Grinder has reduced machining time to approximately one-fourth that required by usual methods.

With an average amount of profile grinding work in your plant, this machine can make possible extremely worthwhile production savings. Let us send you full information.

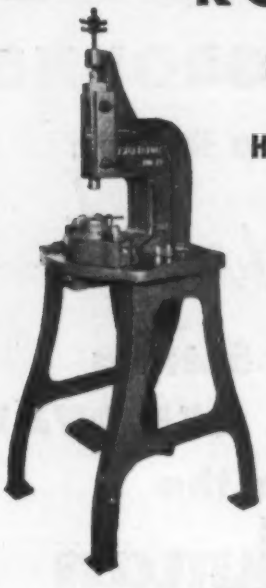


THE WORK IS ALWAYS VIEWED IN THE OPERATING PLANE

BUY MORE WAR BONDS

WICKMAN PROFILE GRINDER

ROYERSFORD - EXCELSIOR



PUT YOUR LIGHT METAL STAMPING ON THIS HEAVY RAPID FOOT PRESS

The Royersford-Excelsior No. 10 Foot Press meets all requirements in a machine for handling a wide variety of light work. Every detail has been developed to assure operating convenience and speed.

Features include an adjustable gib for taking care of plunger or machine surface wear; stroke adjustment is also provided; foot lever treadle can be set to suit operator. Die block is clamped to T-slot in base of housing and is machined to receive die holder or vise furnished with machine. Punchings fall into conveniently placed table drawer.

SPECIFICATIONS

Height—floor to table—2' 7".
Table Size—23¼" x 15".
Depth of Throat—3".
Stroke (Max.)—3".
Capacity—½" through 1/16". soft steel.

Immediate deliveries available. 12 different sizes available.

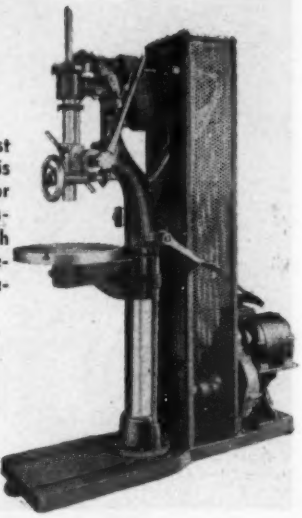
IMPROVED 21-INCH UP-RIGHT POWER DRILL

FAST AND ACCURATE
SIMPLE AND STURDY

Every modern convenience for fast precision drilling and easy handling is provided in this Royersford-Excelsior motor driven back-geared drill. It combines simplicity and operating speed with strength and rigidity and can be depended on to drill up to its 1½" capacity with utmost accuracy.

Gears are machine cut—bearings larger and powerful—change from a plain drill to a back-geared drill can be made by merely sliding the gears—spindle is provided with ball thrust bearings top and bottom, counterbalanced, and has automatic stop with quick return—table. has quick action screw for raising and lowering.

Diameter of table 18"; spindle traverse 9"; spindle to table 29".



Full detailed specifications on these machines available promptly on request.

ROYERSFORD FOUNDRY & MACHINE CO., INC.
ROYERSFORD, PENNA.

The NEW "ABRASAW" No. 47
CUT-OFF MACHINE

This pedestal type machine — improved and streamlined in appearance and construction — provides machine and base in a single casting. Large coolant tank is now in base of machine with coolant pump at the rear.

Vises can be furnished for straight or combination straight and angle cuts.

Capacity: Solids up to 1"; tubing and light sections up to 2".
Floor Space: 28" x 50".

Send for complete details.

THE BRIDGEPORT SAFETY EMERY WHEEL CO.
1286 W. Broad St., Bridgeport, Conn.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers. Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

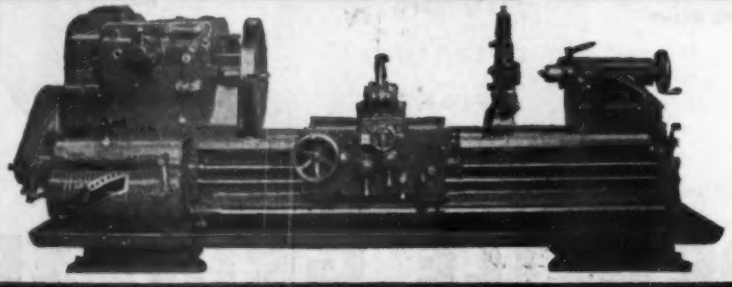
Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS · CRANK SHAFTS

Drilling and Tapping Machines
(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

SPRINGFIELD GEARED HEAD LATHES

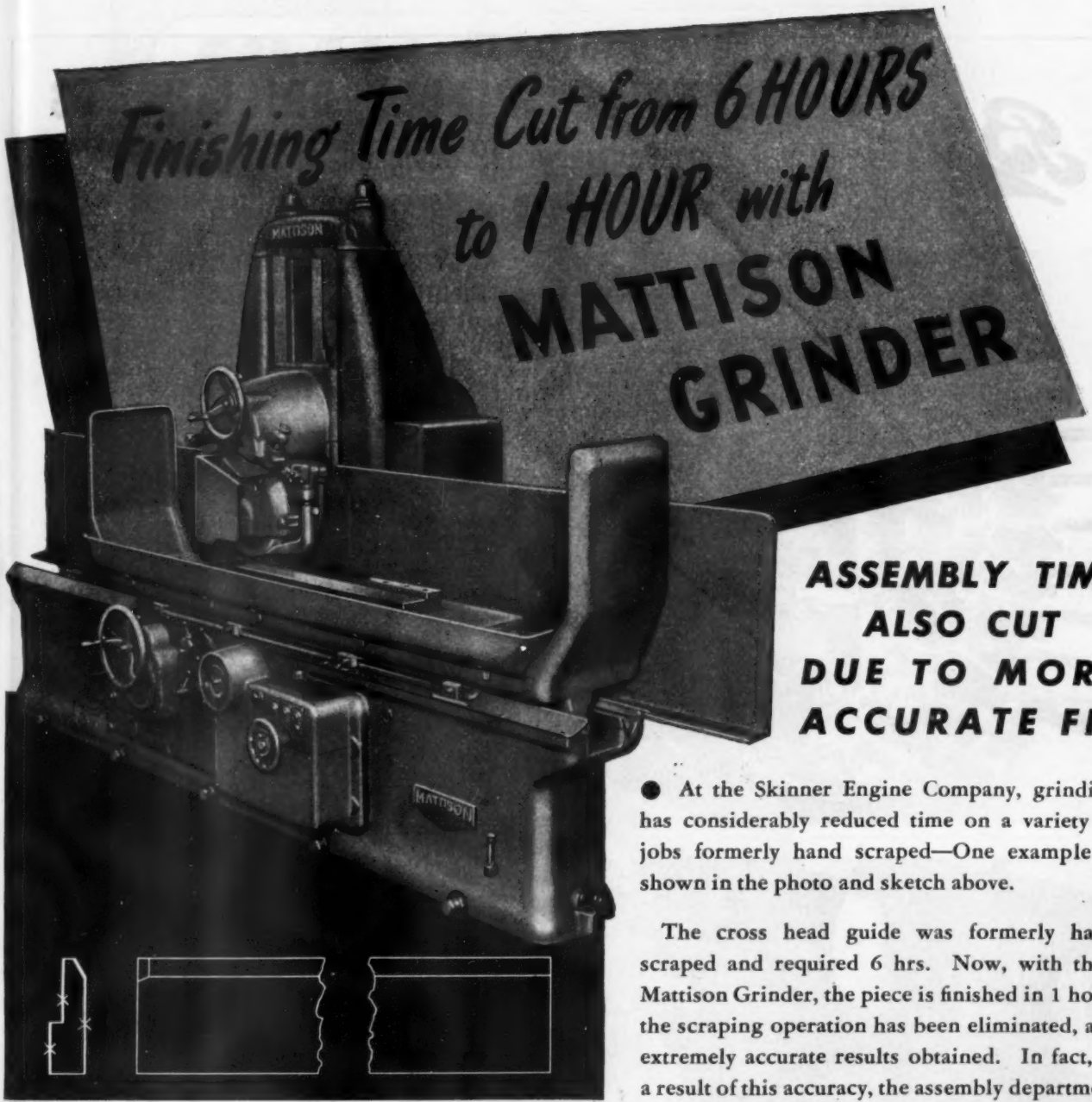


for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

Finishing Time Cut from 6 HOURS to 1 HOUR with MATTISON GRINDER



Cross Head Guide previously hand scraped in 6 hrs. NOW GROUND in 1 hr. Greater accuracy provides additional time saving in assembly department due to better fit.

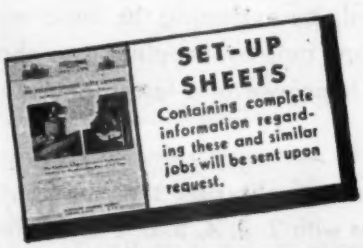
ASSEMBLY TIME ALSO CUT DUE TO MORE ACCURATE FIT

● At the Skinner Engine Company, grinding has considerably reduced time on a variety of jobs formerly hand scraped—One example is shown in the photo and sketch above.

The cross head guide was formerly hand scraped and required 6 hrs. Now, with their Mattison Grinder, the piece is finished in 1 hour, the scraping operation has been eliminated, and extremely accurate results obtained. In fact, as a result of this accuracy, the assembly department reports that they are also saving time due to the better fit.

In many other plants, Mattison Grinders are taking on jobs previously finished by other methods — cutting time, helping speed up production and providing fine finish and accuracy to close limits.

For further data, write for free set-up book or send in your sketch or blue print, and we will gladly furnish time estimates.



Write for free set-up book containing further examples, showing how others have reduced time and increased production with Mattison Grinders.

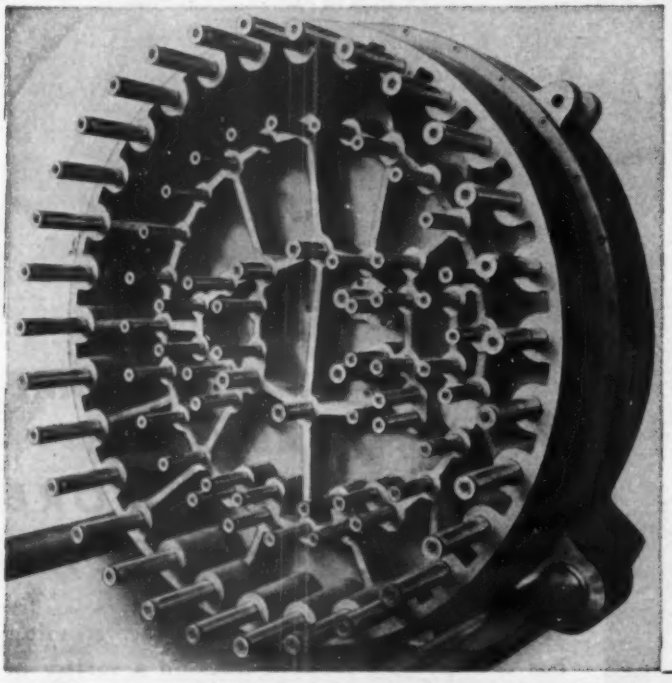
MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

Buhr

MULTIPLE SPINDLE DRILL HEADS

are engineered, designed and built by men of long experience in this field



A TYPICAL EXAMPLE IS THIS 82 SPINDLE BUHR HORIZONTAL DRILL HEAD . . . *for drilling*

32 - .257
14 - 5/16
36 - 17/32 dia. holes.

This is the right hand head of a 2-way Hydraulic Horizontal Machine.

All spindles and gears are of alloy steel heat treated and ground, ball bearings are used throughout and an oil pump keeps them in a bath of oil. Vertical adjustment is provided in all spindles to compensate for unequal drill lengths and to adjust drills to proper depth.

BUHR MACHINE TOOL COMPANY
Green and Davis
ANN ARBOR **MICH.**

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment.

Photo at right shows tap held in Blake bushing

"Payed for itself in 6 weeks"

IT'S THE BLAKE TAP GRINDER

This comment was made by a manufacturer who has a girl operating their Blake Tap Grinder on ½" 20 taps. The chances are, you too will find the Blake a profit maker in your own shop — not only by extending the life of every tap, but, by keeping taps sharp, machine efficiency is improved and less spoilage and broken taps result.

The Blake Grinder will sharpen the chamfer on right- or left-hand taps with 2, 3, 4, 5, 6, 8 or 10 flutes. Capacity — No. 0 to 2". Mail the coupon for full details.

Please send folder giving complete details on the Blake Tap Grinder.

NAME ..... TITLE .....

COMPANY .....

STREET .....

CITY ..... STATE .....

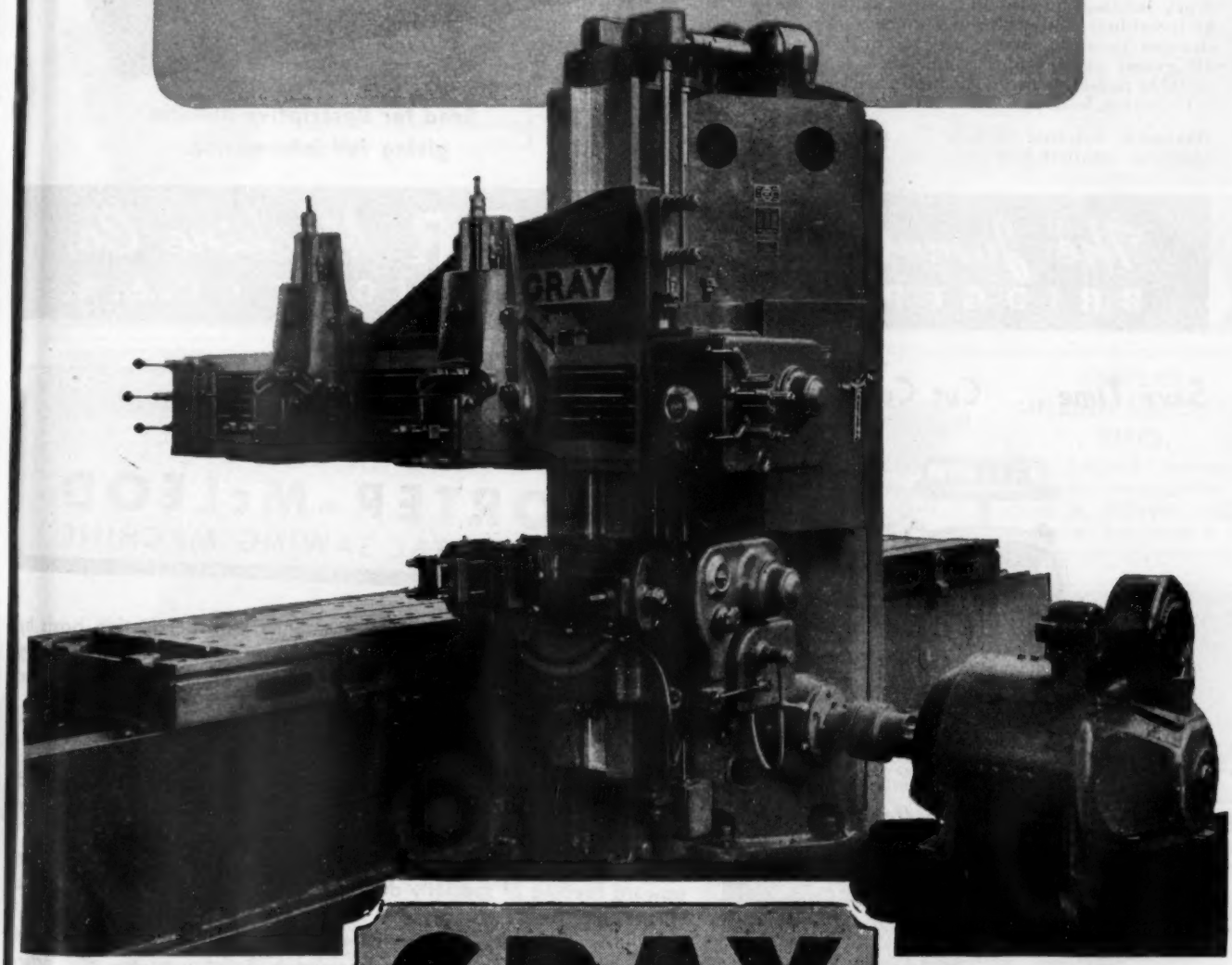
A.M.

EDWARD BLAKE COMPANY
374 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS [illegible] DRILL PRESSES

SMALL but RUGGED

● Even a school boy would know that this Gray Openside is a rigid machine: and a planer hand—well ask any of them what they think of Gray Planers. Gray builds Openside Planers from this 36" to the 120" capacity machine.



THE G. A. GRAY COMPANY
Cincinnati Ohio, U.S.A.

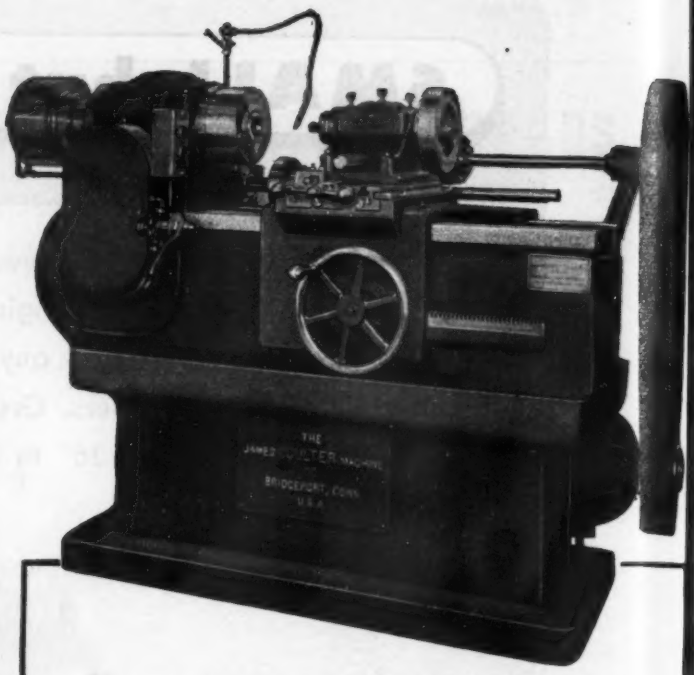
THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT · CONNECTICUT · U.S.A.

Save Time . . . Cut Costs

Remarkably fast cutting of Metals is assured by

PORTER-McLEOD
COLD METAL SAWING MACHINE

Cutting of metal stock is put on a really high production basis by this powerful, conveniently handled, clean, fast and accurately cutting Porter-McLeod machine. It can be depended on to save time on the wide range of stock cutting involved in war work.

In addition to its capacity for handling up to 8" round or 7½" square stock, this machine is provided with a unique method of holding work which enables it to nest economical quantities of bars and shapes for multiple cutting. All cutting is fast because a 3" per minute feed is provided.

Fast, accurate work and long blade wear are made possible by an upward feeding of specially designed and supported blade and by a friction disc feed.

Outline your cutting-off problem and ask for our recommendations to solve it. Send at once for Descriptive Bulletin on the 8" Porter-McLeod cold metal sawing machine.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U.S.A.

A Complete Line of CARBIDE TIPPED

Cal-Cutters

For Your Milling Machines

WANT to "walk" through those deep cuts in steel? The Cal-Cutter face mill illustrated at right is designed with negative rake and negative helix, and cuts those tough heat treated and alloy steels at feeds and speeds far beyond the capacity of ordinary cutting tools! Gives better surface finish, too, does more work without downtime for re-sharpening, cuts the cost-per-piece.

New Cal-Cutter Catalog 381-A gives complete data on carbide-tipped cutters for milling aluminum, brass, bronze, magnesium, cast iron, cast steel, forgings, mild and alloy steels. Includes specifications and ordering data . . . outlines valuable operating tips. *Send for your free copy now!*

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Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

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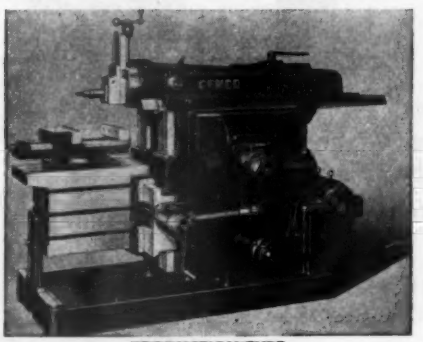

PRODUCTION TYPE

PLAIN TYPE A fast utility machine for a wide variety of the average shop work and for training purposes in industrial schools.

PRODUCTION TYPE Massively constructed with a large table to handle medium heavy work on a peak production basis with high limits of accuracy.

UNIVERSAL TYPE Ideal for tool and die work, experimental laboratories and model shops or where angular work set-ups are required.

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Manufacturers of Precision Equipment SINCE 1917

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5 in., 6 in. and 7 in. sizes

All parts Interchangeable

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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CONVERT your engine lathe into a turret lathe in 15 seconds. To fit Bench lathes and lathes up to 24" swing. Designed to increase production. 6 DAYS DELIVERY.

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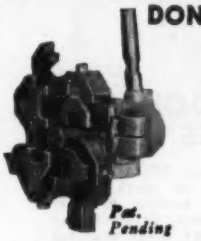

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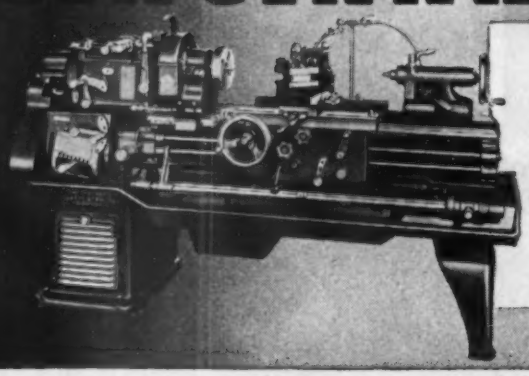

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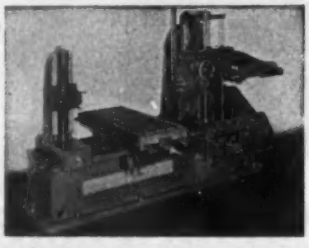

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Motor Driven
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HAND FEED

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FOR SMALL DELICATE JOBS

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel

Reasonably Prompt Delivery

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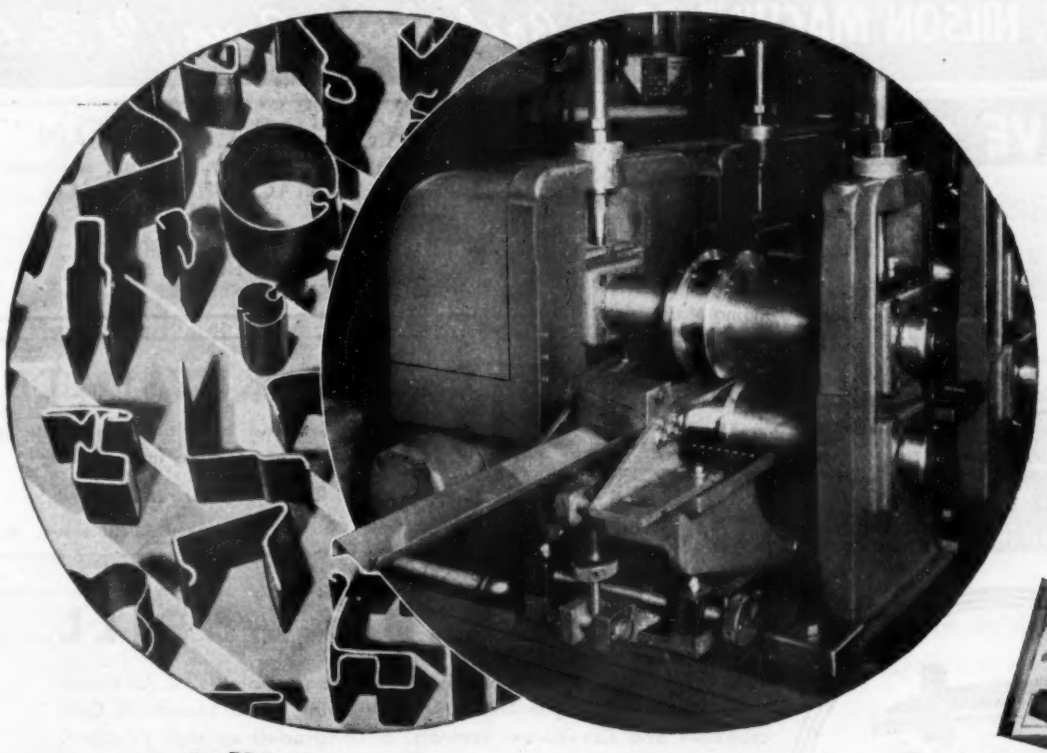

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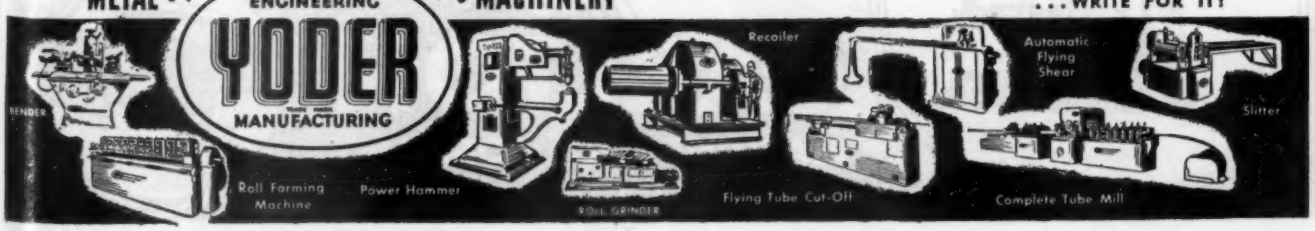
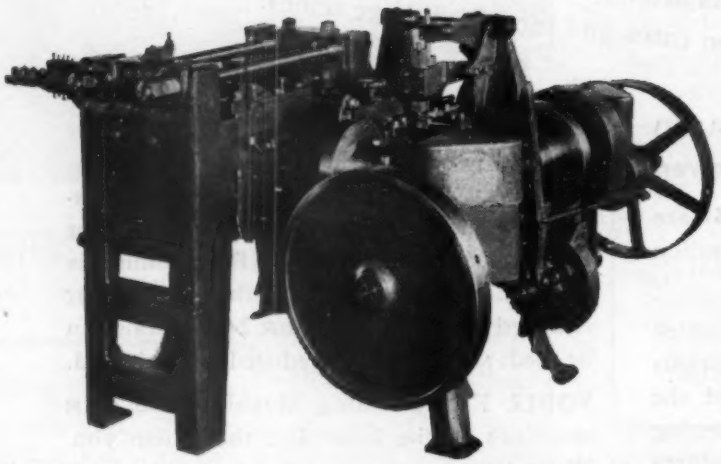


HANDLE YOUR SWAGING, STAMPING, PIERCING, BLANKING and FORMING of COILED METAL

ON THE **NEW NILSON AUTOMATIC PRESS and FOUR SLIDE MACHINES**



These Nilson machines are built in two sizes and are fully described in Bulletin No. 90, available promptly on request.

. . . for fast, heavy duty work

An outstanding feature of these combination power press and four slide machines is the powerful, silent action of the main press slide which is operated by crank motion through toggle or knuckle joints. Overhead stay rods contribute to the tremendous strength and rigidity of this machine.

Other features include simple and easy changing of accessible and removable die set, open construction of forming slides and tool adjustments made without interference.

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Nilson's more than 30-year experience in the design, development and manufacture of special, high production automatic machinery is available to assist you in producing any special machines you may require. Consult our engineers and be assured of a comprehensive service.

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No. 1½ (HAND FEED)

Get acquainted with the complete line of Abrasive Grinding Machines.

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Horizontal Boring, Drilling and Milling Machine

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This low cost machine will handle internal keyseating jobs up to 1¼ in.

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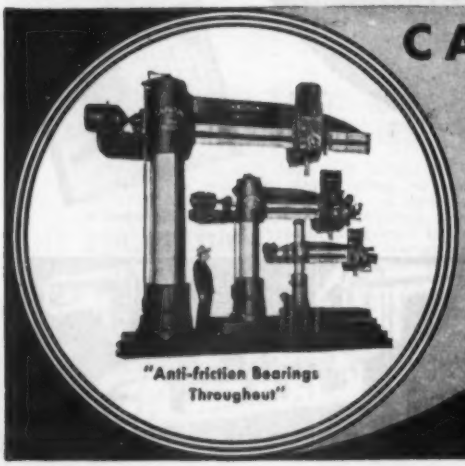

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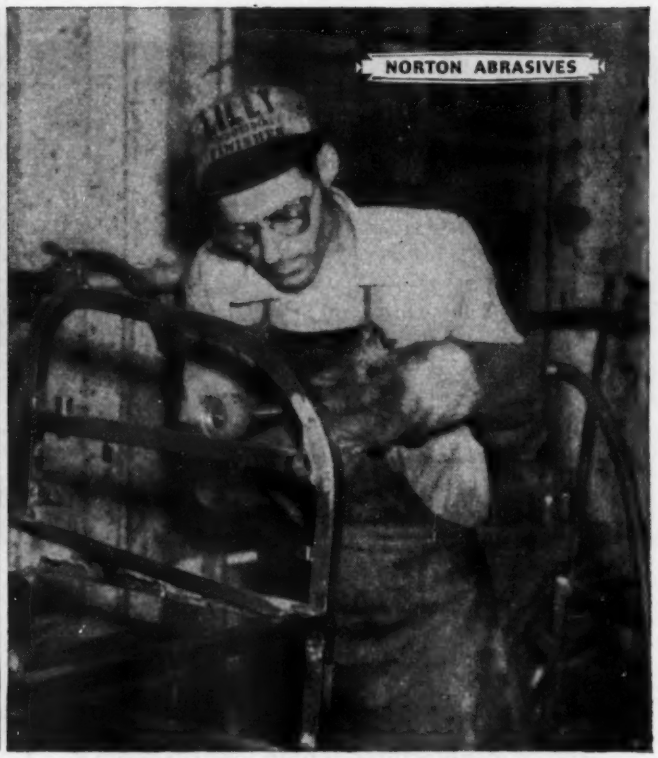
Spirapoint finishes recess and produces radius*



Spiraband rapidly removes burrs and rough edges*

There's Still Time To Benefit

METALITE CLOTH GADGETS (abrasive) have made almost unbelievable records in speeding up and improving the finish of countless metal parts vital to war production.

Yet one division of a large producer may not be aware that another department has doubled or trebled output simply by adopting these skillfully designed, ready-to-use, abrasive cloth "gadgets" of the exact shapes, the very grits and just the right cushion to snug into any odd shaped part.

So even now, after two years of war, we urge you to send for our booklet, "Blue Print for Faster, Better Production". It is full of illustrations of these new coated abrasives actually at work in large war plants and shows their host of shapes, sizes and grits ready for instant application on many time-wasting operations in your own plant.

Then, to complete the service, if you just give the word, we'll have an experienced field engineer not only show them to you but *demonstrate them on your own jobs.*

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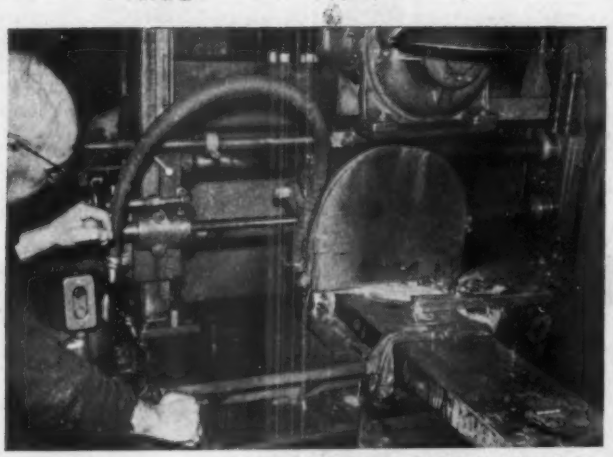

No. 302 Campbell Abrasive Cutting Machine cutting 18/8 Stainless Steel forging blanks from slab 2⅝" x 10" x 14'

Campbell DOES ANOTHER PRODUCTION CUTTING JOB THAT "COULDN'T BE DONE"

● The job placed in the lap of a nationally known manufacturer of drop forgings made it necessary to cut 18/8 Stainless forging blanks from flat stock 2⅝" x 10" x 14'—cut-off lengths 9¾".

Without a **CAMPBELL**, cuts took so long that it was impossible to maintain production.

Now a **CAMPBELL No. 302 ABRASIVE CUTTING MACHINE** makes those cuts in 10 minutes—finished, burr-free cuts to dimension, without waste.

If you write the Campbell Engineering Department, they will develop production procedure and costs for you, too, without any obligation.

State materials, shapes and sizes you are cutting. Give lengths of stock, lengths of cut-off pieces and production rate required.

The data worked up for you will be based on actual experience. Remember **CAMPBELL** manufactures the only complete range of abrasive cutting machines—8 types and 19 models—and these machines are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramics. Solid bars, tubular and flat stock.

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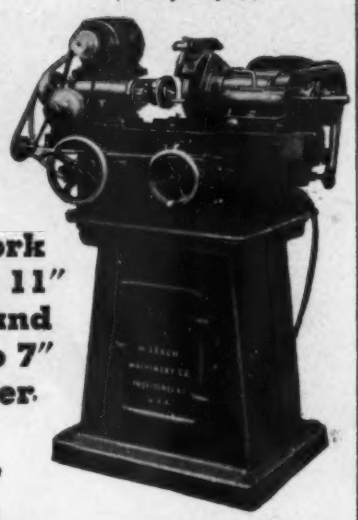

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BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request—Write!

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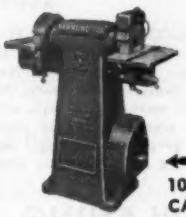
GRINDING and POLISHING EQUIPMENT

CHIP BREAKER GRINDERS
Light and Heavy Duty



10" DRI CARBIDE TOOL GRINDERS

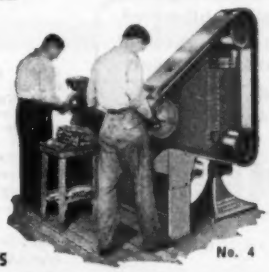
14" WET CARBIDE TOOL GRINDERS

Hammond 10" and 14" Wet Grinders feature patented No Spray — No Splash concealed wheel guards.

CARBIDE TOOL GRINDERS

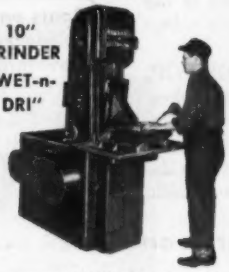
Hammond offers you complete carbide tool room equipment . . . Chipbreaker Grinders, 6", 7", 10" and 14" Wet-n-Dri, and 20" Wet Grinders for rough and finish grinding of all size carbide tools and hi-speed tool Hammond products incorporate many years of practical "know-how" experience of carbide tool makers, tool engineers and shop men.

No. 3 BACKSTAND-IDLERS



No. 4

Hammond units above show typial applications of Backstand-Idlers Nos. 3 and 4, as indicated, with guards for converting polishing lathes into hi-production abrasive belt grinders or finishing machines.

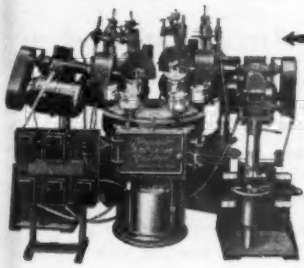


10" GRINDER "WET-n-DRI"

Hammond 10" giant for wide range of larger pieces.

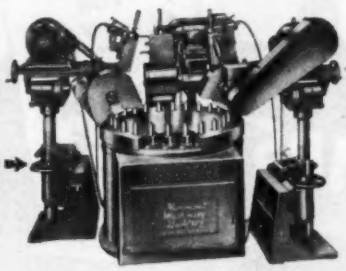
ABRASIVE BELT GRINDERS

Hammond 4", 6" and 10" Abrasive Belt Grinders, and Backstand-Idlers for converting polishing lathes into high production grinding and finishing units, are built to the highest machine tool standards. Any material that can be ground may be surfaced, deburred, chamfered, beveled or finished by the abrasive belt method—faster, more economically and better!



INDEXING TABLE
Hammond SBL-6, 34" indexing table; 6 stations; four 5 HP, 50-81 lifting wheel heads with "Auto-Dopers".

CONTINUOUS TABLE
Hammond 48-CR-24, 48" Continuous table; 24 stations; three 7½ HP, 50-84 wheel heads with "Auto-Dopers".

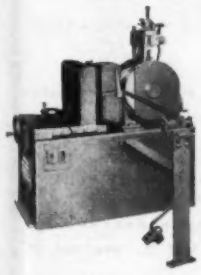


AUTOMATIC FINISHING

Hammond J-Retary Indexing and Continuous Table Automatics are hi-production, large volume finishing machines for deburring, brushing, polishing or buffing operations. They are built in various combinations of relatively standard units combining rotary or continuous tables with wheel heads and stands to suit the particular operations required. Consult our engineers.

OTHER HAMMOND HIGH PRODUCTION MACHINES

CYLINDRICAL GRINDING POLISHING AND GRINDING
¼" to 9" Outside Diameters



Hammond standard unit for use with wheels or Backstand-Idlers and abrasive belts.

"NO DUST" and OTHER GENERAL PURPOSE GRINDERS
For wheels 10" up to 24" diameters.

SINGLE and MULTI SPEED GRINDERS
1, 2, 3, 4 speeds, 5 to 15 HP for grinding wheels 18" up to 30" in diameter.

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Single and variable speeds, 2 up to 50 HP capacity.

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FRED H. COLVIN'S INSTRUCTION MANUAL.

ANOTHER of Fred H. Colvin's important job-help manuals packed with the kind of expert instruction that makes advancement into a profitable machinist's job easier, faster, and more assured! *Just out*—a practical, self-help manual explaining the starting steps in planing, shaping and slotting to give the beginner rapid, reliable aid in preparing for a machine shop job.

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By FRED H. COLVIN

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125 pages 120 illustrations, $1.25

No experience is necessary to learn quickly the first essentials of operating shapers, planers and slotting machines with the aid of this practical little instruction manual.

The directions are so clear, and the many illustrations so directly informative, that without ever having been in a machine shop, the reader will feel that he is thoroughly familiar with these machines and their parts, the kind of work they do and how it is handled.

Here are some of the job pointers it offers:

- how shapers, planers, and slotters operate
- function of the ways or guides on which the planer table operates
- tool shapes and angles usually accepted as standard
- how the tool lifter operates
- how to set the tool block and apron
- cautions and "musts" on clamping work
- types of clamps and holding methods used in various shops
- checking work on planer with dial gages, square, or micrometer
- examples of the way in which the vertical shaper is used in toolroom work

The cost of this very complete and reliable instruction is extremely low—only $1.25.

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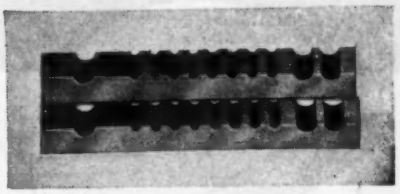
DRESSING IS SIMPLIFIED . . . by the New Time-Saving C-66 . . . RADIUS DRESSER FOR SURFACE GRINDERS

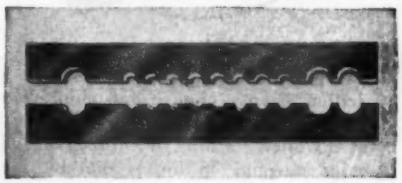
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one-hour job in 10 minutes — accurately — conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

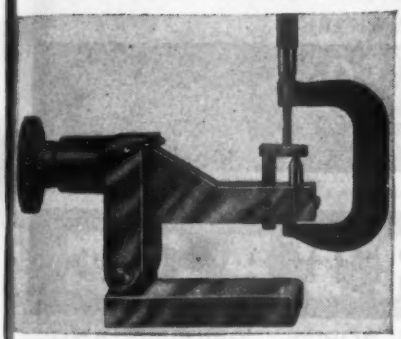
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



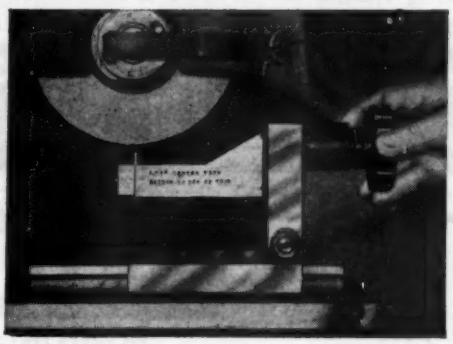
Two High Speed Tool Bits ground for drill jig.



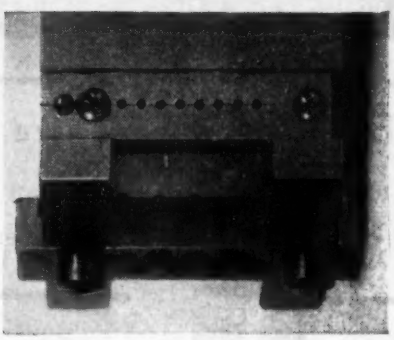
Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.



Drill jig completely assembled.

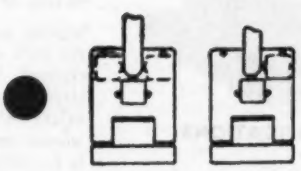
For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to ⅜" can be held accurately in line with the vertical center line of spindle.

.013 Male and Female Radius

.500 Male and Female Radius



180° and 90° Male Dressing.

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, ¼K diamond, $5.00.

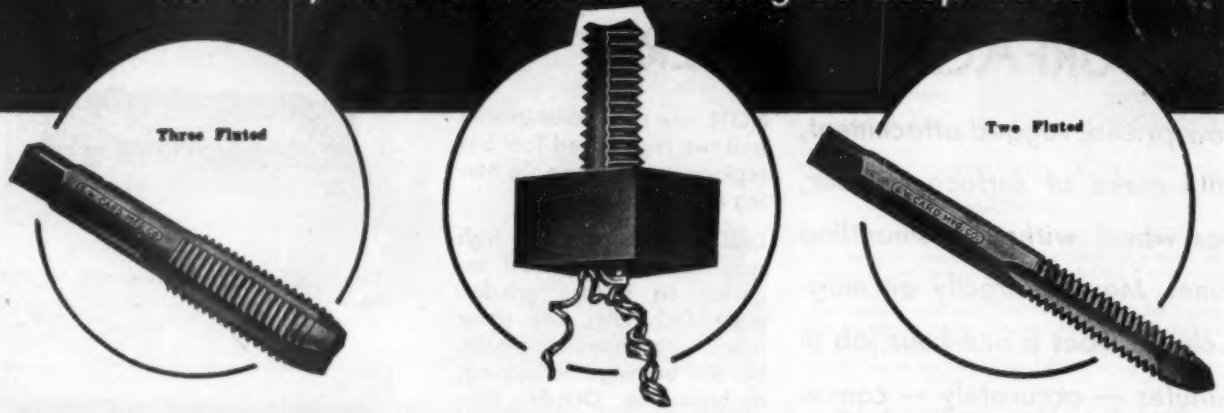
SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.

CARD SPIRAL POINTED TAPS

for free, accurate thread cutting in deep holes



Designed for tapping deep through holes or blind holes drilled deeply enough for chip clearance at bottom of hole. Cutting is done by the first few threads milled at an angle. Chips are forced ahead of tap, preventing chips clogging in flutes, thereby increasing strength of tap and minimizing chances of breakage.

CARD SPIRAL POINTED TAPS assure free cutting, and fine quality threads. Furnished in carbon steel and high speed steel types. Fully described in Card Catalog, available promptly on request.

CARD TAPS ARE SOLD BY LEADING DEALERS EVERYWHERE

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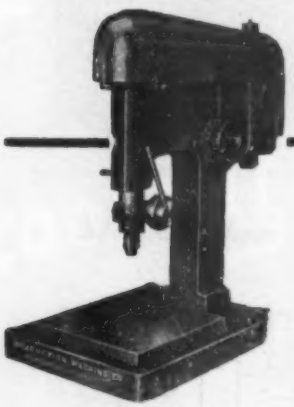
REED TYPE 25 Sensitive Bench Drill



an all purpose machine for precision work

SPECIFICATIONS

Capacity ¼"
Spindle Travel—3"
Head Adjustment—3"
Table Surface—11" x 11"
Belt and Chuck furnished
Motor ½ HP ball bearing

●

Write for full description and specifications

Infinite spindle speeds—from 1500 to 10,000 R.P.M.—controlled by convenient hand wheel and shown by speed indicator, make this a highly versatile machine for a wide variety of light, precision work.

Moving parts are totally enclosed, the drill chuck being the only part exposed. This feature together with stream lining contribute to its absolute safety even in the hands of women operators. Rugged strength is provided by using only two castings for base and column. Utmost precision is achieved by full mounting of spindle on finest quality ball bearings.

The Reed Type 25, is made in from 1 to 4 (inclusive) spindle models. Individual speed control and motor drive are provided for each spindle.

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

● Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.

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That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

★

Good advertising speeds information from those who have it . . . to those who need it.

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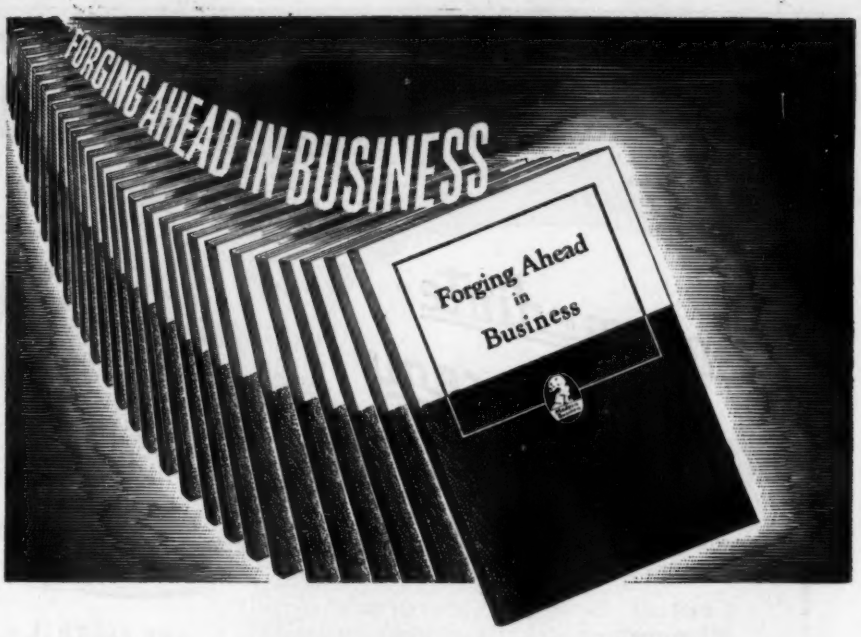
330 West 42nd Street New York



All Serious-Minded Production Men

SHOULD HAVE THIS FREE BOOKLET!

FORGING AHEAD IN BUSINESS contains a message of particular importance to production men. This is your opportunity to obtain a copy of this famous book, which has been described as a "turning point in the lives of literally thousands of men"!

Although "Forging Ahead in Business" has been distributed to more than 3,000,000 men, today's timely edition was written in the light of recent world-wide developments. Its 64 pages represent more than three decades of successful experience in training men for leadership in business and industry.

It demonstrates the method which the Alexander Hamilton Institute uses to give you immediate help in your present position, while preparing you for post-war opportunities. Subjects directly related to the work you are doing now, PLUS other subjects of fundamental value to the business executive, are discussed in the book and placed in significant relation to one another. Thus, a helpful, over-all picture is provided.

Said one man who had sent for "Forging Ahead in Business":

"In thirty minutes this little book gave me a clearer picture of my business future than I've ever had before."

. . . and that represents the opinion of the Institute's 400,000 subscribers, *including 134,000 production men!*

The booklet further explains how it is possible to offer this essential training in a minimum of time; how the Institute program fits in with the most crowded of war-time schedules.

Among the prominent industrialists who assisted in the preparation of the Course, which is described in "FORGING AHEAD IN BUSINESS" are: Alfred P. Sloan, Jr., Chairman of the Board, General Motors Corp.; Thomas J. Watson, President, International Business Machines Corp., and Frederick W. Pickard, Vice President and Director, E. I. du Pont de Nemours & Co.

Send for "FORGING AHEAD IN BUSINESS" TODAY!

Frankly, this booklet has no appeal for the immature mind. It does not interest the man who, for one reason or another, is wholly satisfied to plug along in a mediocre job. But, for the alert, future-minded individual—the man with ambition and "drive"—"Forging Ahead in Business" has a message of distinct importance. If you feel that it is intended for you, don't hesitate to send for a copy today. Simply fill in and mail the coupon below.

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Please mail me, without cost, a copy of the 64-page book—"FORGING AHEAD IN BUSINESS."

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This micrometer is triple tested and is guaranteed accurate. If for any reason you are dissatisfied with this tool, return it with this guarantee within 30 days of purchase date to dealer from whom you purchased, and full purchase price will be refunded.
This guarantee, of course, is void in case of breakage, abuse, accident or other cause not inherent in the tool itself.
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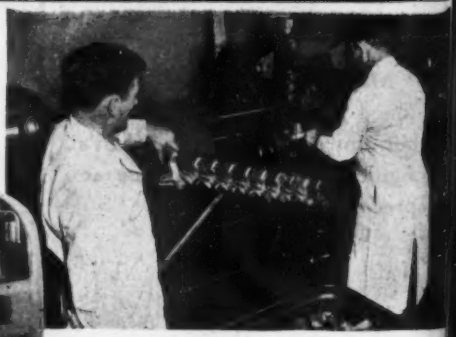
AUBURN . . . RHODE ISLAND

TANK LINKS . . . drilled-faced and reamed in 50 seconds with HOEFER 2-WAY MACHINE . .

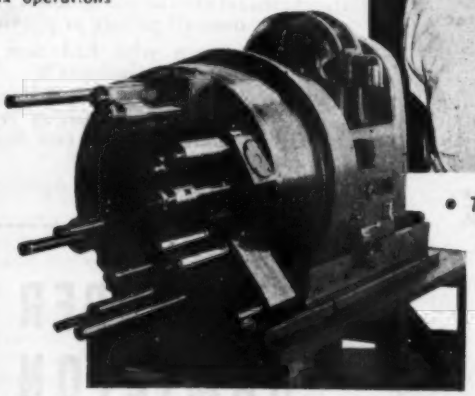
★ Both the 6 and 10 spindle heads are mounted on a 10 h. p. unit to become part of a 2-way machine in the center of which is mounted a 6-station indexing trunnion for machining tank links.

Both roughing and finishing reamers have over-running spindles so that reamers travel clear through link from one side only while the drills work from both sides and then only partly through entire link. The six operations including loading required only 50 seconds.



• *Two-way machine in operation on tank links*

• *6-spindle head*



• *10-spindle head*

Operations for 12" Tank Link

1. Load
2. 19/32" dia. drill—1½" depth
3. Drill through
4. Spot face and countersink
5. Rough ream to .625
6. Finish ream to .629 ± .001

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

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SPECIFICATION FOR A SHIELD BRAND TAP
SMALL things make perfection; perfection itself is no small thing. Thus, perfect accuracy of thread angle, lead, and pitch diameter is achieved for Shield Brand Taps by a whole series of infinitely careful tests, checks, inspections, and scientific measurements which enable us to determine and correct the slightest variation from absolute accuracy—and achieve perfection.
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Plug Hand Tap. No. 131—Carbon Steel. No. 900 — High Speed Steel
Machine Screw Tap, Straight Flute. No 1328 —Carbon Steel No. 901 — High Speed Steel
Spiral Point Hand Tap. No. 1319 —Carbon Steel. No. 908 — High Speed Steel.
Shear Cut Machine Screw Tap. No. 1320—Carbon Steel. No. 903 — High Speed Steel.
Taper Pipe Tap, Interrupted Thread. No. 919 — High Speed Steel.
Taper Pipe Tap. No. 132—Carbon Steel. No. 902 — High Speed Steel.
Nut Tap. No. 131A —Carbon Steel No. 913 — High Speed Steel.
Stay Bolt Tap. No. 133D—Carbon Steel. No. 909 — High Speed Steel.
Tapper Tap, Straight Shank. No. 133C—Carbon Steel No. 910 — High Speed Steel.

TAPS THAT EXCEL IF ACCURACY IS YOUR CREED

Shield Brand Taps are manufactured to the highest standards of accuracy known to the tool industry. We welcome the opportunity to test them in your most exacting work. Their economy, value, and accuracy are best demonstrated there.

THE STANDARD TOOL CO.

CLEVELAND

"Red Shield" Brand Drills

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SIMPLICITY DOES IT!

Simple in design—that's the main reason for the strength, precision and unvarying performance of Namco Circular Chaser Dieheads.

Adjustment for all four cutting tools is quick and positive — through only two screws — and adjustment "stays put".

When Circular Chasers need replacement, a duplicate set can be inserted in head in two minutes. No trying for size, no delay, no spoiled work. Uniform production is maintained on long run lots of straight or taper threads on pressure-tight fittings.

Typical Namco Diehead job. Aircraft fitting —pressure-tight threads—Class 3 standard.

Circular thread chasers ground to gauge accuracy, may be reground through 270° circumference — they last ten to fifty times longer!

Chasers and blocks may be interchanged with circular hollow mills in the same double-duty head. Heads are available for both stationary and revolving spindle machines—capacities $\frac{5}{16}$" to $4\frac{7}{8}$".

Here are the most efficient threading and hollow milling tools made—for a wide variety of work on all standard automatics. Catalog D-42 gives details.

THE NATIONAL ACME CO.

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ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

Engineered Diamonds!

HERE'S YOUR ANSWER TO *Accurate Radii —*

• The form produced by a radius dresser is only as accurate as the diamond used to dress that radius form. It is because Wheel Trueing engineers know this—because they know the importance of extreme accuracy and precision in radius forming operations that the diamonds used in Wheel Trueing Radius Forming Tools are selected with the greatest care according to the particular radius each is to dress.

But careful selection of diamonds alone is not enough! The diamonds in these tools are set by experts who make certain that each diamond is concentric with the shank. And throughout the various manufacturing operations, these tools are subjected to rigid tests and careful inspections by men whose skill, experience and engineering knowledge cover the fields of industrial diamonds and grinding wheels. These men know diamonds! They know the production man's problems! They know how to design and manufacture tools to solve those problems!

Next time you buy radius forming diamond tools specify Wheel Trueing! You'll be assured of utmost precision, accuracy, dependable performance and money-saving economy. You'll get radius forming tools *engineered to your jobs!*

Other Wheel Trueing products include diamond tools for straight or form dressing—thread dressing—contact gauges—and drill bits for coring or blasting.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Ave. Detroit 6, Michigan

Planning Ahead for a Proven Demand

Producers of gages don't develop manufacturing facilities over night. First, trained personnel must be assembled, top mechanics in their lines; second, special machine tools are required; third, manufacturing methods and processes must be right. Essential as are these three factors, most important of all is probably that priceless ingredient—experience. For years Kobe has made precision equipment and in 1939, 1940 and 1941 started expanding their previously private gage plant. Then as American industry swung into their new, gigantic task of producing for war, Kobe's picture changed. Trained personnel increased, more and more machinery and testing equipment found its way into the Kobe plant, and the plant itself expanded in size, in volume and in character of work handled. The recentness of this expansion has resulted in an uniquely balanced plan for comprehensive precision gage manufacture.

After Victory we hope to tell you of the part Kobe master and reference gages are playing in the war. It will make profitable reading for post-war industry. The reason is simple. The modern and expanded facilities of Kobe's gage plant, developed to the fullest during wartime, will be available for the manufacture of gages to check accuracy and precision in every peace-time industry.

The largest proportion of present day production is going for war needs, but the facilities of this modern plant will be available for peacetime industrialists. Even today, working with new materials, Kobe has devoted considerable thought to adaptation to peacetime needs. Testing, improving, re-testing and perfecting—production efforts all aimed at what industries will require after the war.

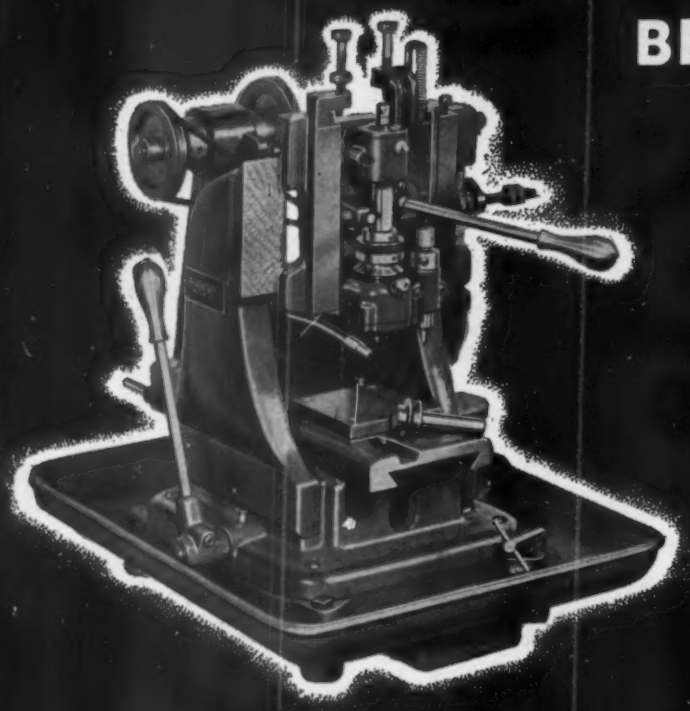
KOBE

Master and Reference GAGES

KOBE, INCORPORATED

3040 East Slauson Avenue • Huntington Park, California

You Can Do a Wide Range of Work With This Wade MOTOR DRIVEN BENCH PROFILER



FOR SMALL PROFILING, MILLING, SLOTTING, RECESSING AND ROUTING OPERATIONS

SPECIFICATIONS

Working area:
2″ x 4″ horizontal, 1¼″ vertical
Fixture block: 4″ x 4″ x ½″
Work surface of table: 4¼″ x 4″
Travel of vertical slide: 1¼″
Travel of table: 4½″
Travel of cross slide: 2″
Cutting tool collet: Any standard size up to 5/16″ dia. Standard ¼″ collet supplied unless otherwise specified.
Distance of table to nose of spindle, when down: 2¾″
Center distance, cutter spindle to follower: Approx. 2-1/16″
Follower cutter spindle: No. 2 B&S taper
Motor: Standard ¼ h.p., 3-phase
Speeds: Four speeds ranging from 1000 to 8000 RPM
Dimensions: 19″ wide, 24″ long, 22″ high.
Weight: Net, 260 lbs., boxed, 285 lbs.

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

You can do a wide range of precision work with this Wade Motor Driven Bench Profiler . . . work such as profiling, milling, slotting, recessing and routing operations . . . on a variety of small parts such as watch and clock plates, clock mechanisms, mechanical time fuses, parts for small firearms, range finder parts, typewriter and adding machine parts, etc.

It is a precision built profiler for production work. Women and unskilled help can quickly become expert in its operation and turn out duplicate precision work within exceedingly close tolerances.

The Wade Bench Profiler is a time and money saver . . . a small, moderately priced machine tool that will pay for itself over and over in your production line.

Write today for catalog

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

YOURS

. . . FOR CONCENTRATION ON PRESENT AND POST-WAR PROBLEMS

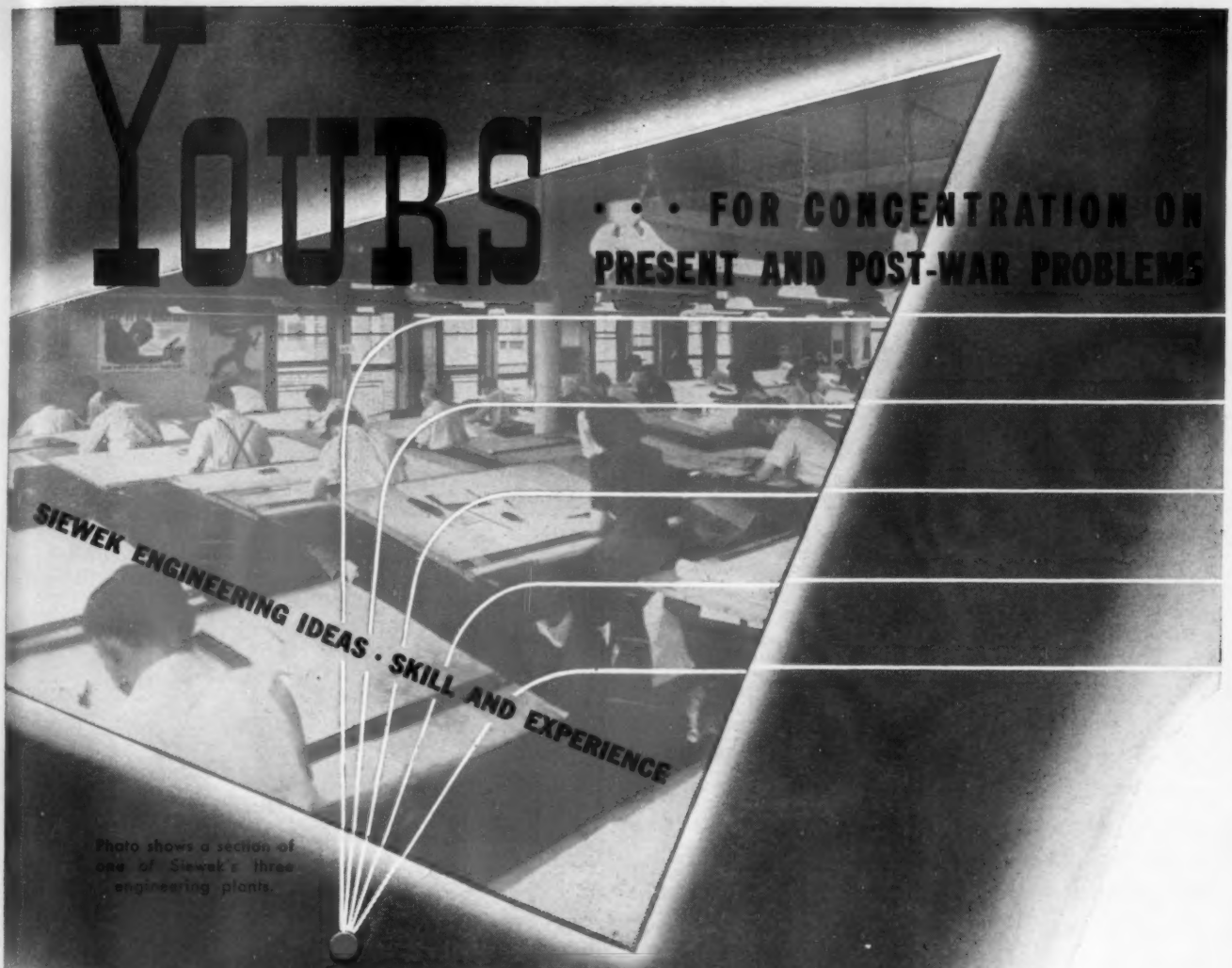


Photo shows a section of one of Siewek's three engineering plants.

NEW PRODUCTS for the post-war period present serious problems for firms whose war-burdened engineering departments are already overtaxed. New products mean new designs—and new designs mean new machines and new tools.

Into the gap between the bare idea for a new product and a practical set-up for its manufacture steps Siewek Engineering Division (on invitation). This nationally known organization is staffed with highly skilled engineers and experienced tool designers. They pool their brains and skills with yours whether the problem involves refining the product or designing and building special machines and tools on which it will be made.

For further information on how you can fit this organization into your plans for current and post-war operations, write today.

SIEWEK

Designers and Builders of Tools, Dies, Jigs, Fixtures and Special Machines

ENGINEERING DIVISION

OF DOMESTIC INDUSTRIES, INC.

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ELIMINATE THE HOME-FRONT BOOBY-TRAPS FROM YOUR PLANT

Oil and grease on your floors are booby-traps that make casualties of the soldiers of production, by causing slipping and falling accidents, inviting costly fires, and side-tracking vital manpower into non-productive cleaning labor. Rid your plant of these aids-to-the-Axis quickly, efficiently and economically by using SPEEDI-DRI—a white, granular substance, easily spread by hand, that absorbs *all* oil and grease, sets up an immediate non-skid surface, retards fire, and saves a lot of labor needed elsewhere. Write for free sample or demonstration.

GRUMMAN AIRCRAFT says:

"We use SPEEDI-DRI in practically every plant," writes A. W. Stevens, Maintenance Supervisor of Grumman Aircraft. "Maintenance crews use it to dry up leaks on oil hydraulic breakdowns. It makes their work safer and cleaner."

SPEEDI-DRI
OIL AND GREASE ABSORBENT

UL

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New York 1, N. Y.

Midwest and South
WAVERLY PETROLEUM PRODUCTS CO.
Philadelphia 6, Pa.

West Coast
WAVERLY PETROLEUM PRODUCTS CO.
Russ Building, San Francisco 4, Calif.

Prompt Service from Warehouse Stocks in Leading Cities

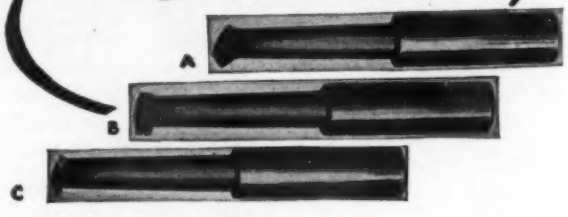
EXPERT MECHANICS CHOOSE PLOMB SOCKETS TO HELP SPEED WAR PRODUCTION

❶ **They work better...**Thin, strong walls and accurate sizes increase efficiency and speed.
❷ **They are safer...**Design and special steels protect against dangerous breakage.
❸ **They give longer service...**Properly used, they will last indefinitely.

All other tools in the Plomb line are also built to highest quality standards. From midget screwdrivers to mammoth industrial wrenches they are famous for the better, longer-lasting service they give. For better war production, see the Plomb dealer near you for your hand tool needs–Plomb Tool Company, Los Angeles 11, Calif.

PLOMB

For efficient performance on high production



(a) For Internal Boring
(b) Facing and Bottoming
(c) Internal Threading

Made in wide range of sizes. (The small sizes shown above. The larger sizes come with cutting heads screwed securely to high-tempered shanks of special alloy.) Style A Boring Tool will outlast six normally-forged tools. Style B particularly suitable for use on turret lathes and automatics. Especially adaptable for recessing. Style C has advantage of cutting cleanly a wide range of different threads in smallest borings imaginable. Also available with carbide tips.

Ask for Catalog K-1139 for Super High Speed Tools and for K-398 for Carbide Tipped

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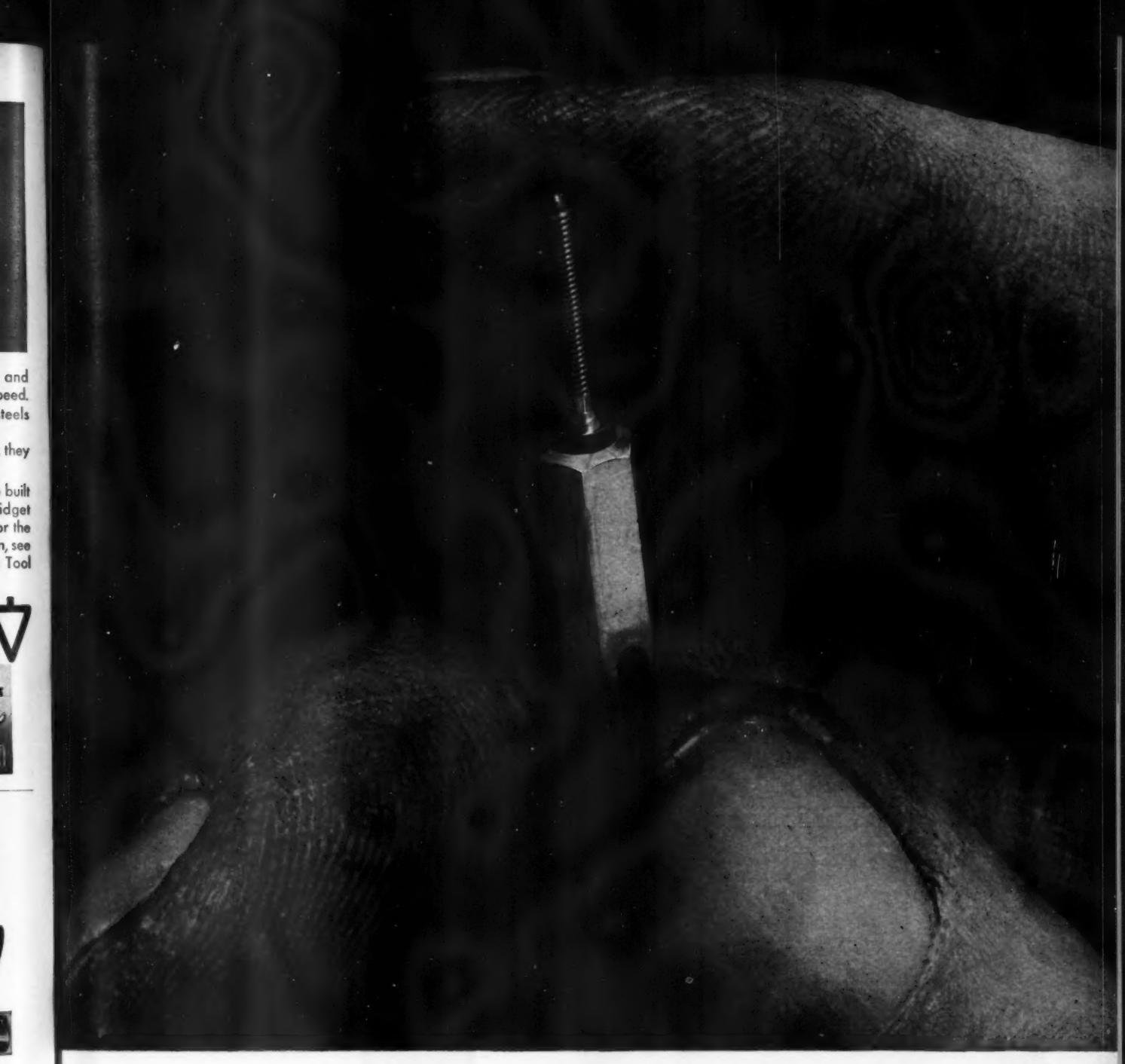
14775 WILDEMERE AVE. · DETROIT 21, MICH.



THREADED PLUG GAGE

Threads smaller than the papillary ridges of a finger, ground to an accuracy of .0001 of an inch – that's what you get when you buy a VARD 0-80 NF Threaded Plug Gage ☆ We specialize in the manufacture of extra fine, Right or Left Hand threads, special thread forms and extreme tolerance gages ☆ In some of the standard thread sizes in NEF, NF and NC gages, from sizes 0-80 to 1½ in., we can supply gage members out of stock. These fine threads as well as special threads can also be obtained in any size ranging from 0-80 to 12 in. and can be made to fulfill your requirements. Deliveries are being handled in a reasonable period of time ☆ VARD gages are made from special tool steel, hardened, ground and lapped. They are tested on the most exact mechanical and optical inspection equipment and come to you in waterproof cellophane enclosures, securely packed in individual boxes ☆ Write for more complete information on any VARD products.

ARMY E NAVY

VARD INC.

read & Plug Gages • Snap Gages (VARD or JOHN-SONS Type) • Special Taps • Precision Ground Optical Lenses & Filters • High Fidelity Mirrors

PASADENA 8, CALIFORNIA

Accurate SURFACE PLATES

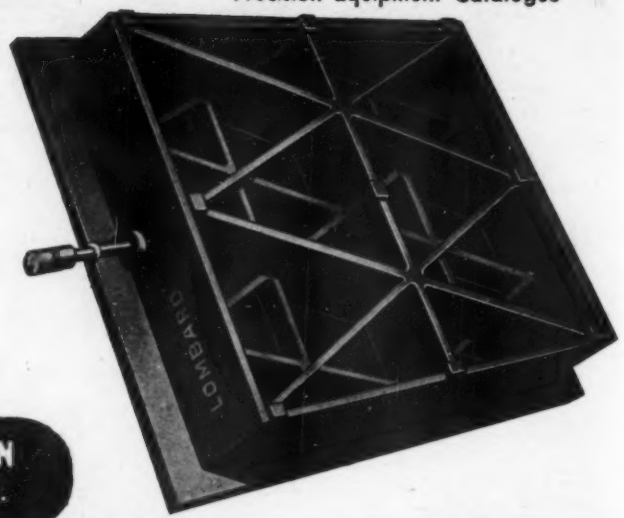
for Prompt Delivery'

For immediate delivery place your order now before stock items are exhausted. If possible give alternative size. Write Dept. 29 for latest Precision Equipment Catalogue

Representing the acme of vital precision inspection equipment, Lombard Master Style Surface Plates are now available from stock. With their scientifically designed ribbing, three point suspension and extremely rugged construction, these master accurate surface plates are carefully heat treated and hand scraped to extremely close tolerance. Commercial style surface plates are also available. These plates although of a different basic design are now being universally used for general inspection and shop use.

	Sizes	Types A	B	C
The Master Style	14"x18" to 48"x96"	.0001	.0003-4	.0005-.001
The Commercial Style	8"x12" to 48"x96"	.0002-3	.0005-.001	

Planer finish also available in both styles. All plates are furnished with lifting handles and finished wooden covers.



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In four sizes with fourteen different dial graduations, indicating thousandths, half-thousandths or tenths of thousandths inches.

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Lead Screw ground from Solid AFTER hardening.

Original Accuracy
Maintained

Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

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Gages of all Types and Sizes for CARTRIDGE CASE INSPECTION...

MANUFACTURERS OF CARTRIDGE CASES are cordially invited to write for a Price List on our complete Gaging System for Cartridge Case Inspection.

THIS SYSTEM INCLUDES

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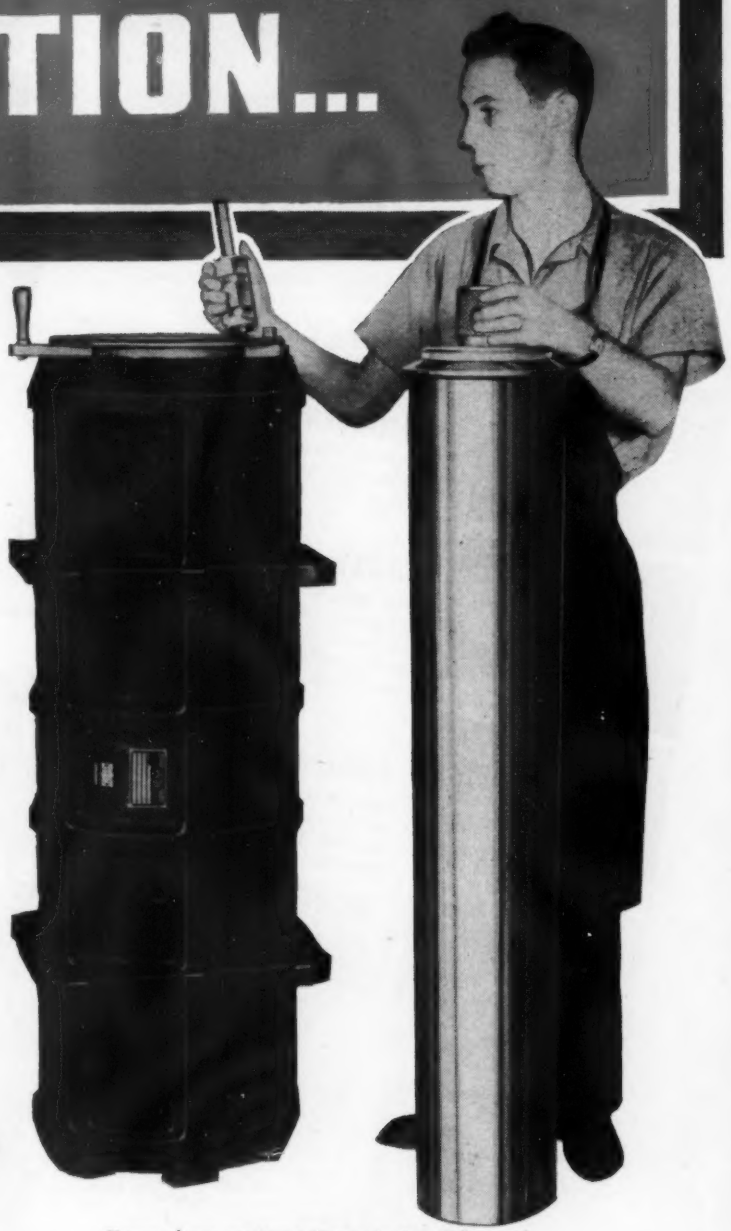

Shown above are two extremes in size of the maximum profile chamber gages that we manufacture.

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REG. U. S. PAT. OFF.

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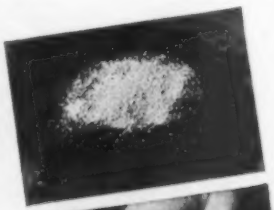
Speed Victory
BUY WAR BONDS

MANUFACTURERS OF "QUALITY PRODUCTS"

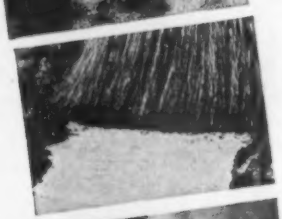
Prevent needless falls and accidents caused by slippery, oil-soaked floors with ABSORBO, the granular compound, that provides a safe, sure footing on floors subject to oil or grease spills.

Here's How It Helps:



ABSORBENT
The sponge-like granules quickly absorb oil or grease up to 45% to 50% of their weight.

EASILY APPLIED
Just sprinkle Absorbo on the oil-soaked floor or where oil or grease spills are likely to occur, and safe traction is provided immediately.



SWEEPS CLEAN!
Allow it to remain on the floor a few minutes or as long as desired. Sweep up, and then note the clean, dry surface.

NON-ABRASIVE
Because of the absence of gritty substances, it will not mar machine parts or surfaces and may be used freely on any type of flooring without danger of abrasive action.

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Approved by Underwriters' Laboratories as a Class 1 non-combustible. Even when thoroughly oil saturated, it resists burning and retards fire from spreading.

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ADAPTABLE to a wide range of light or heavy work—for maintenance or production. Operated either mechanically or electrically, these hammers are not steam or air hammers . . . adjustable for different thicknesses of dies and material . . . extremely powerful . . . flexible in operation with perfect control and little effort . . . ram free from obstruction assuring full vision of work. Complete information upon request. Ask about repair parts service.

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WAUSAU MURCO **WISCONSIN**
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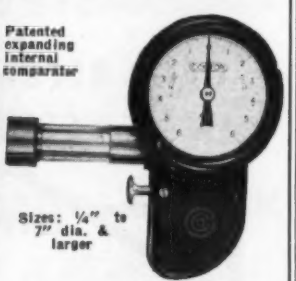
"I can gage to a split-tenth with my COMTORPLUG"

For gaging bores to fractions of .0001"—

COMTORPLUG

Patented expanding internal comparator



Sizes: ¼" to 7" dia. & larger

A gage that is widely used by final inspectors, yet is equally useful in the hands of relatively unskilled bench inspectors or machine operators—such is Comtorplug. Unique patented features assure self-alignment and self-centering, effecting automatic 2-point gaging to fractions of .0001". Not a passing reading. Shows not only size, but also detects any irregularities such as front or back taper, out-of-round, bell mouth, etc. Reaches to the very bottom of blind holes. A great aid in speeding quality production wherever precision bores are required.

Request Bulletin 29

THE COMTOR CO.
68 Rumford Ave.
Waltham, Mass.

20-minute analysis of alloy steel

It used to require many hours to make a complete quantitative analysis of a heat of alloy steel.

Today the picture has changed.

Using spectrographic methods developed by our engineers and metallurgists, Bethlehem can now run off a complete and accurate quantitative analysis in just 20 minutes. This analysis covers aluminum, tin, tungsten, molybdenum, copper, chromium, vanadium, silicon, nickel and manganese.

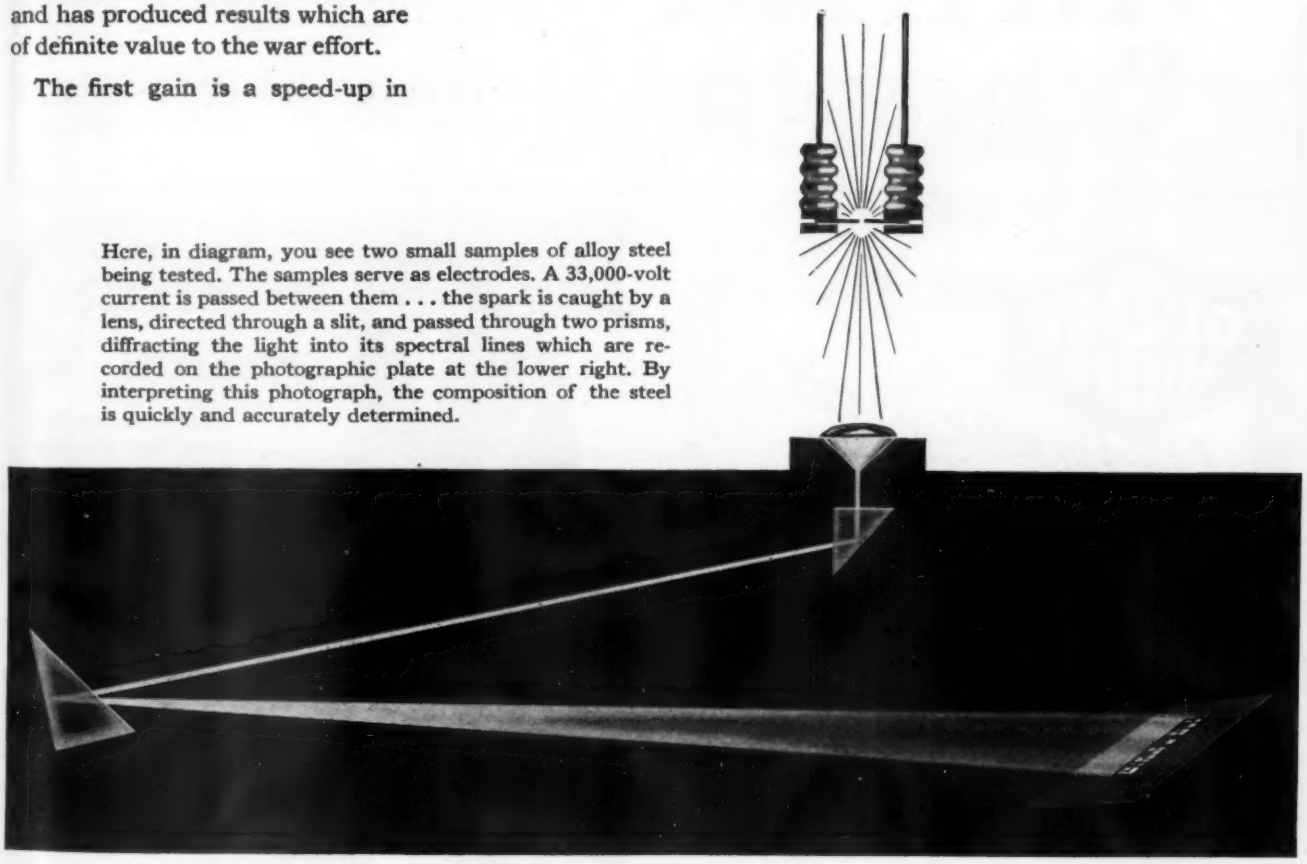
The idea of spectrographic analysis is not new. But the speed and accuracy of this technique *is* new, and has produced results which are of definite value to the war effort.

The first gain is a speed-up in alloy-steel production. Formerly, certain electric-furnace heats were considerably delayed due to waiting for analyses to be made by snail-paced chemical methods.

Now, however, we run two complete analyses—one just after the steel becomes molten in the furnace, and one at the ladle—plus as many as six intermediate quick tests to control certain elements which fluctuate during the refining of the heat.

The second gain due to spectrographic analysis is a definite improvement in the quality of the steel itself. Tests can be made closer to the time that the steel is ready for tapping into the ladle—and in this way the composition can be controlled more exactly.

With Bethlehem, spectrographic analysis has progressed far beyond the experimental stage. It is helping materially in the production of larger tonnages of alloy steels, and in the advancement of quality standards. It is a hard-working actuality.



Here, in diagram, you see two small samples of alloy steel being tested. The samples serve as electrodes. A 33,000-volt current is passed between them . . . the spark is caught by a lens, directed through a slit, and passed through two prisms, diffracting the light into its spectral lines which are recorded on the photographic plate at the lower right. By interpreting this photograph, the composition of the steel is quickly and accurately determined.

This photograph portrays the spectrum of a typical sample of alloy steel. The vertical stripes represent various alloy elements and tell how much of each is present in the steel.

BETHLEHEM STEEL

VITRIFIED

Keep production on its toes by standardizing on . . . VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiency on Vitrified Carborite Wheels. . . . For accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . Also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

Vitrified Wheels

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MAKES A MILLING MACHINE OUT OF YOUR LATHE IN 3 MINUTES

Attaches to your lathe, does same precision work as a costly milling machine. Increases swing of lathe 5 to 10 inches, depending on lathe size. Complete line of accessories available, such as Dividing Heads, Vises, Work Holding Fixtures, Arbors, End Mill Holders. Write today for descriptive folder.

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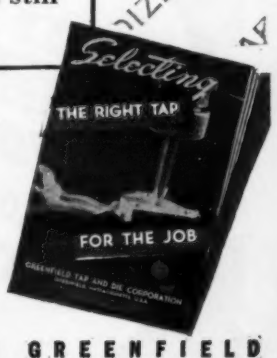
Boeing 314 Clipper (Pan-American)

TODAY . . . *We Span the Oceans*

The contrast in performance between now and the first days of airplanes is one way of looking at their amazing progress. But it's *not* the most vital difference. The real difference between today and 1903 is that today we can build 8000 planes a month.

What has brought about this progress? Mass production? The assembly line? Yes, but before these were possible, there had to come STANDARDIZATION — the adoption of standard interchangeable parts which would assemble instantly without "hand fitting." This basic feat with its attending economies has made available to many, in all fields, products that were formerly available only to a few.

The use of *standard Screw Thread forms and sizes* has contributed enormously to this simplification of manufacture. A more universal adoption of these standards can carry their benefits still further in the years immediately ahead.



Standard Threads— SAVE TIME - SAVE MONEY!

Full utilization of existing accepted sizes, pitches and forms can bring lowered costs to all manufactured products because: (1) it speeds production; (2) it reduces inventory. NOW, when plans for new and better products are taking shape —now is the time for a united effort to bring about greater standardization of threaded parts

Send for booklet "Selecting the Right Tap for the Job"— 18 pages of Facts, Tables, Suggestions

GREENFIELD TAP AND DIE CORPORATION GREENFIELD MASSACHUSETTS

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COMPLETE WALKER LINE

Universal Swivelling Magnetic Chuck for Tool Room

Standard units for practically any service requirement are available from Walker because of the completeness and diversity of the Walker line.

Recognized everywhere for their efficiency and economy in holding work on a wide variety of operations. Walker Magnetic Chucks will help you speed up and cut costs of grinding, milling planing and turning. If you require special designs, Walker can furnish them.

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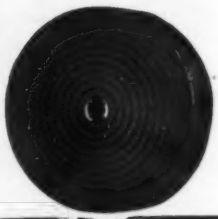
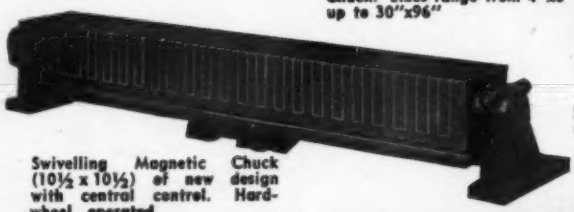
Walker offers a complete range of sizes in Rectangular, Swivelling, Vertical Faces and Rotary types.

Our illustrated bulletin W4 contains valuable information for user of magnetic chucks. Write today. Ask Walker engineers to help you select the chuck you need for your specific service.

No. 618. Rectangular Magnetic Chuck. Sizes range from 4"x8" up to 30"x96"



Style D Face Plate. "Concentric Gap" Type



Swivelling Magnetic Chuck (10½ x 10½) of new design with central control. Hand-wheel operated.

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● Anything less than the best cutting fluids available is a handicap to your production. Equally important is *proper application.* Stuart Oil Products and Stuart Oil Engineering will give all the advantages it is possible to get from cutting fluids.

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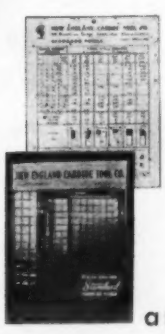

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faster production

and greater accuracy

Power, speed, strength and accuracy are combined in the "HARTFORD." *Tremendous gripping power* is assured at all times by the scientific design and construction of binding and cam-faced handles coupled with absolute jaw alignment. This power is applied instantly and easily on one-hand manipulation of BOTH handles.

Speed in operation is provided by quick gripping and equally quick release.

Strength for hard service is attained by practically unbreakable construction. Base is of semi-steel while movable jaw is a single heat-treated steel drop forging.

Accuracy is assured by a jaw design which maintains jaws in absolute alignment. Construction of movable jaw, with its ground fitting surfaces, is such that work can be held at either end of jaw without any possibility of distortion.

All parts are made to closest gauge tolerances, making it possible to use interchangeable replacement parts which are promptly available from stock.

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Width of Jaw—5"
Depth of Jaw—1-3/16"

MAXIMUM OPENING (Plain Jaw Type)
Jaws in place—2⅝"
Jaws removed—3½"

MAXIMUM OPENING (Swivel Jaw Type)
Jaws in place—2¼"
Weight—40 lbs. Length overall—13". Width overall—8". Height overall—5". Center distance between Jaw Screw Holes —3.258". Distance bottom of jaw to center of jaw screw holes—7/16".

Available in Plain and Swivel Jaw Types.

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HARTFORD
Quick-Acting
MILLING VISE

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Write today for literature giving complete detailed information.

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NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

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Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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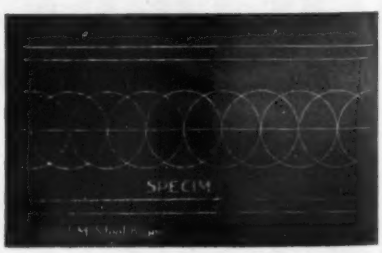
making dies & templates



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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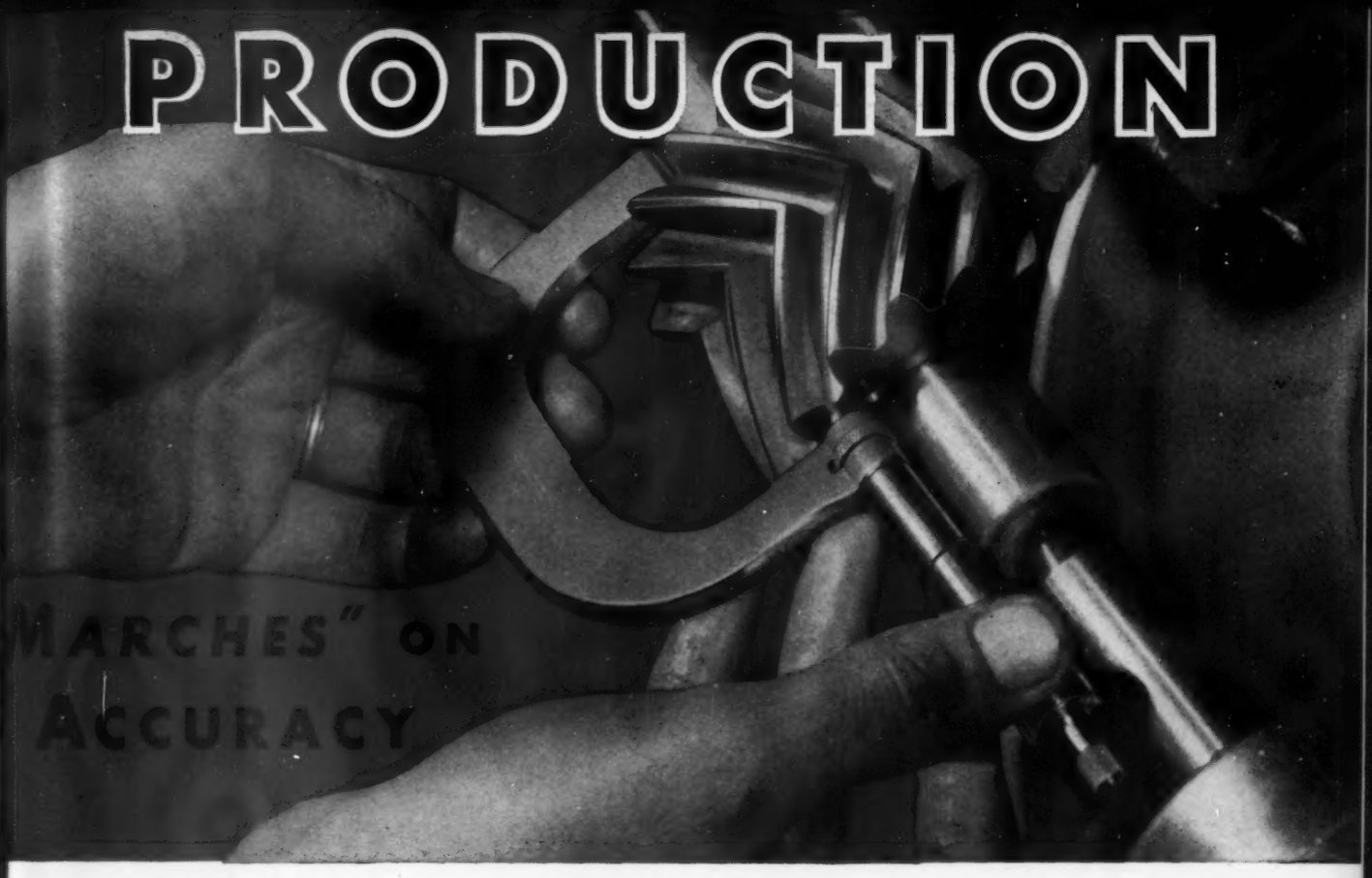
PRODUCTION



It's a duty now to make tools last longer—to keep them dependable and available for accurate work

The first requirement for getting the most out of precision tools — for helping production "to march" — is to understand the importance of proper treatment.

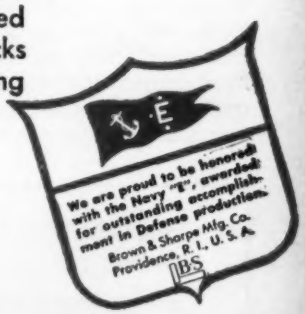
It doesn't take much — a little care here and there will extend the life of a precision tool and prevent premature impairment of its accuracy. Here are some simple suggestions:

Do not "force" the measuring points or surfaces. Do not carry the tool in a pocket having grit in it. In the grinding room protect the tool from coolant which might carry abrasives into accurately fitted parts. Do not subject dial gages and other sensitive tools to hard shocks. Protect graduations, particularly those on vernier tools, from becoming worn or scratched.

Set tools down gently — do not drop them in a drawer or on a shelf. It is a good plan to keep each tool in a box to prevent other tools from striking against finished surfaces or edges. Bases of tools such as height gages, indicators and V blocks should be kept free from dents or pits and should not be used on surfaces having chips or grit upon them.

Finally, keep tools clean and lightly oiled to prevent rusting.

Each tool saved from premature wear means one more available for the manufacture of the implements of war our armed forces need.


We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
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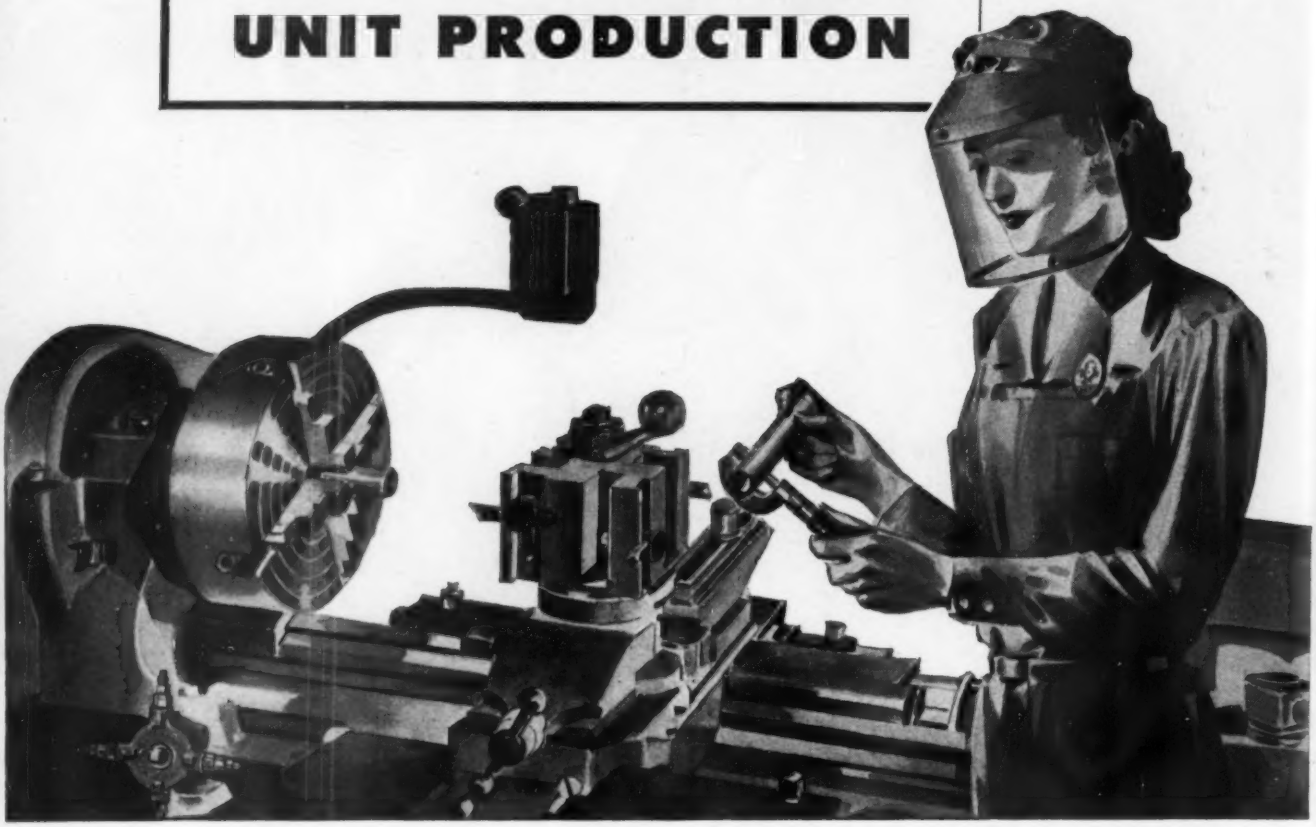
Reproductions of this advertisement for use on your bulletin boards furnished on request.

BROWN & SHARPE TOOLS

HOW TO INCREASE UNIT PRODUCTION

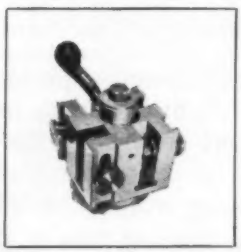


with these Specialties lathe accessories

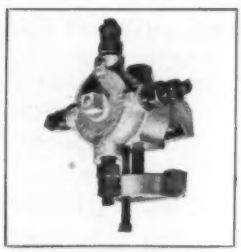
EVEN an inexperienced operator can change from one tool position to another without stopping. It's easy when you have Specialties Cross-Slide Turret, Tail-Stock Turret and Lathe Stop on the machine.

These three new lathe accessories make a production team that can double your output. They enable you to rough and finish turn or bore, counterbore, drill, tap, etc. without stopping the lathe or changing tools. Best of all they help you to produce more vital war material faster than ever. Mail coupon for details on Specialties lathe accessories, including special adapters for complete range of machining setups.

Tail-Stock Turret quickly converts engine lathe into 4-way turret lathe for end-work. Cuts machining costs. Increases production. Saves labor.



Cross-Slide Turret enables multiple machining operations, giving 4 working positions from the cross slide. No stops to change tools.



Lathe Stop saves time. Once the 4 measuring positions are set you just index. Index pin automatically centers and locks measuring arm.

SPECIALTIES Manufacturing Co., Inc.
46 Farrand Street, Bloomfield, N. J.

Please send me full information on SPECIALTIES lathe accessories.

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Company_____

Address_____

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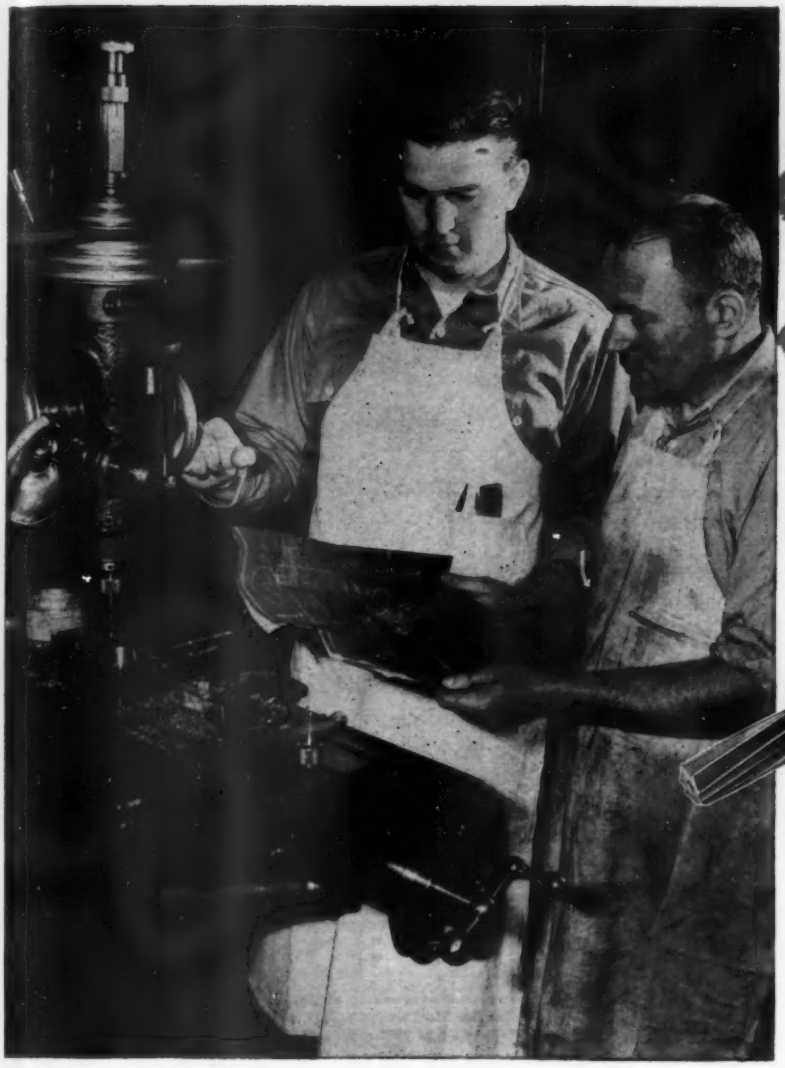
SPECIALTIES
MANUFACTURING COMPANY, Inc.



USE THE *Right* CUTTING TOOL

Selecting for each job the *right* cutting tool—right type, right form, right size—is the first rule of tool conservation. Proper choice in the first place, and care to see that this choice is maintained, will help produce more and better work.

NATIONAL

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The maintenance man is a key factor in the war-busy industrial plant. Machines and equipment MUST be kept running. Time lost by breakdowns means lost production. Good tools are as important as the mechanical skill of the man using them. These men PREFER the VICTOR high-speed steel "MOLY" Type* Hack Saw Blade for fast, accurate cutting; and the Unbreakable Special Flexible Blade for tough sawing in inconvenient places.

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Makers of Hack Saws, Frames, Band Saws, Power Saws

5135

Almond Drill Chuck

The Original Manufacturers of Drill Chucks

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As Pioneers in their field, ALMOND THREE-JAW DRILL CHUCKS have played an important part in machine tool development. They were the first to be placed on the market more than seventy years ago.

Types and sizes are available to fit all machine tools and portable drills.

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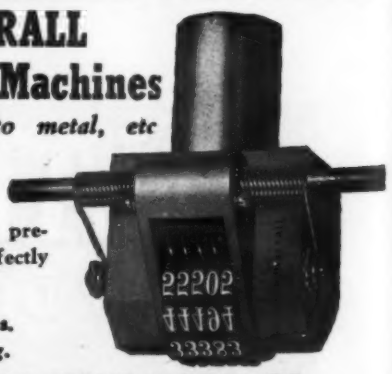

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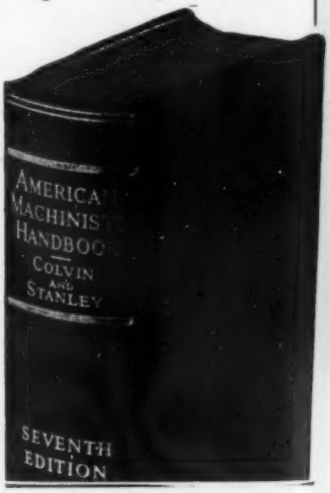

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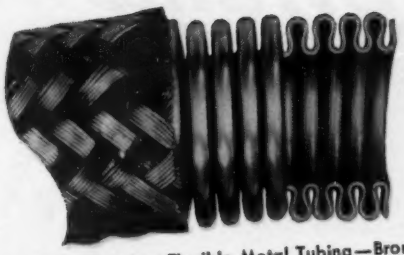
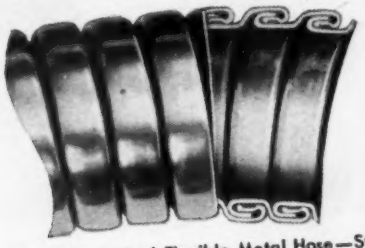


American Seamless Flexible Metal Tubing—Bronze.



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For conveying air, water, oil, steam or fuel, where flexibility is required, there is *nothing* more dependable than flexible metal hose and tubing. Illustrated here are 2 typical installations of American Seamless—selected from a seemingly endless range of applications.

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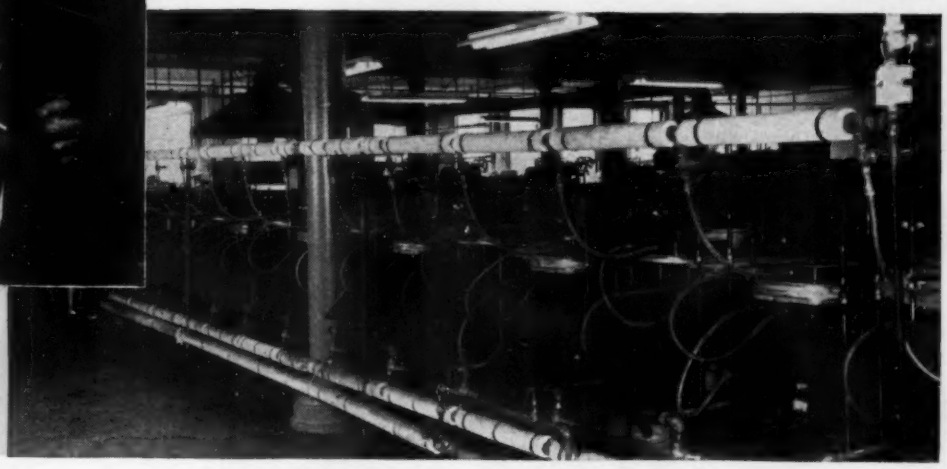

Above: American Oil Feed and Coolant Tubing lubricates the work on machine tools.

Right: Live steam being fed through American Seamless to hat forming presses.

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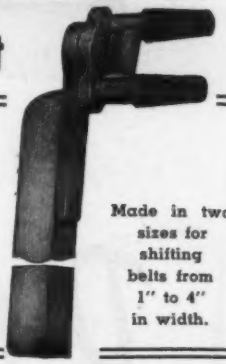

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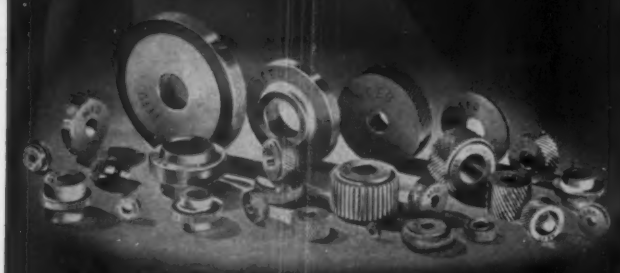

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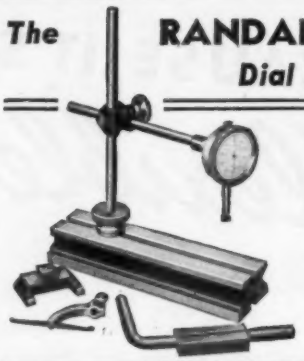

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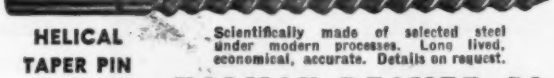

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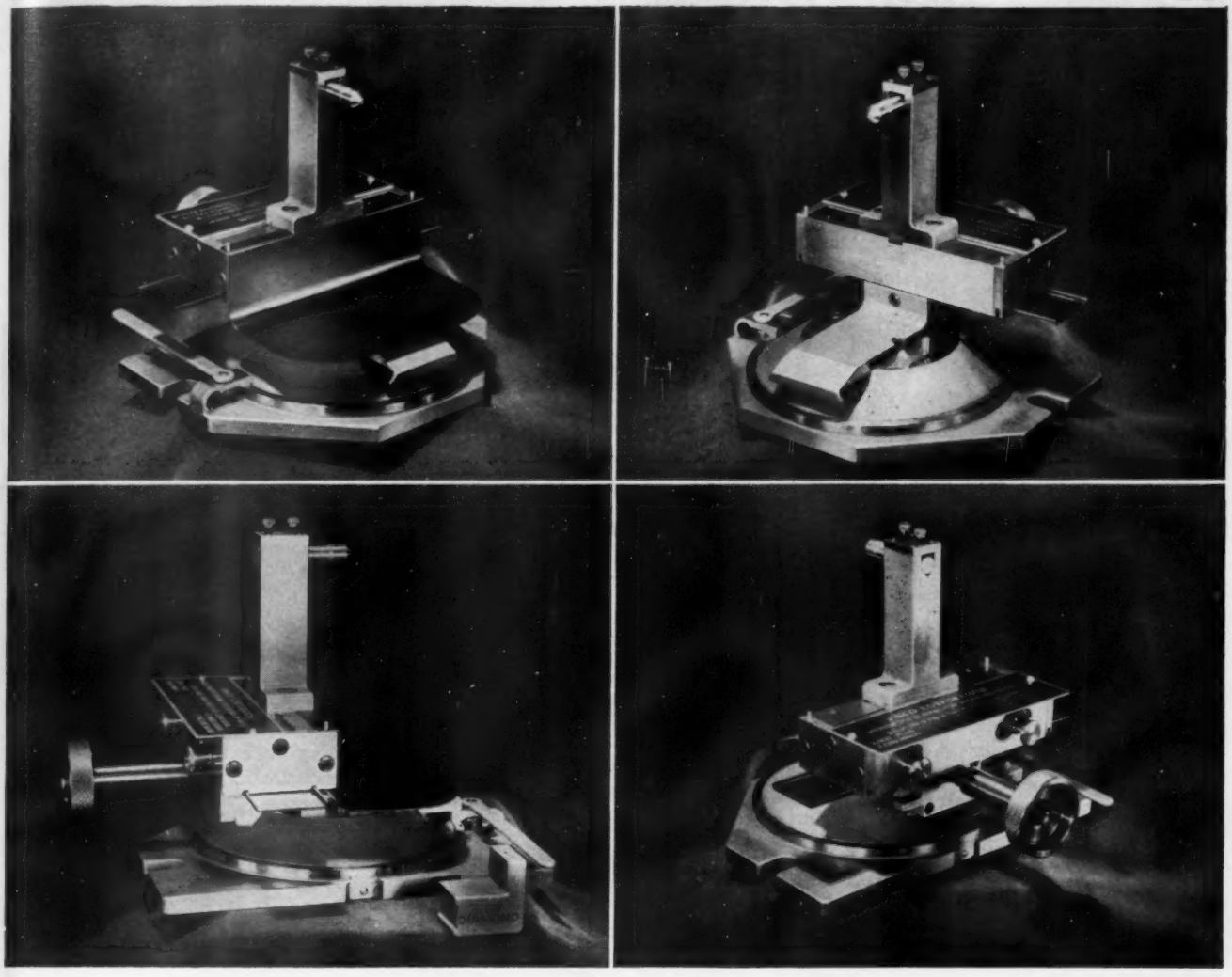

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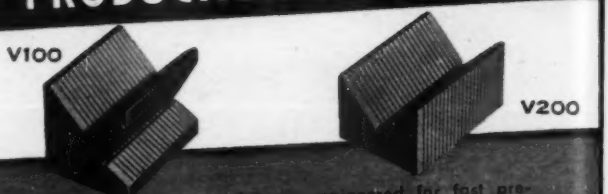

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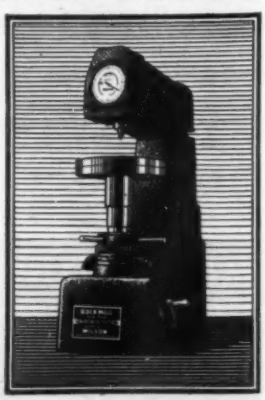

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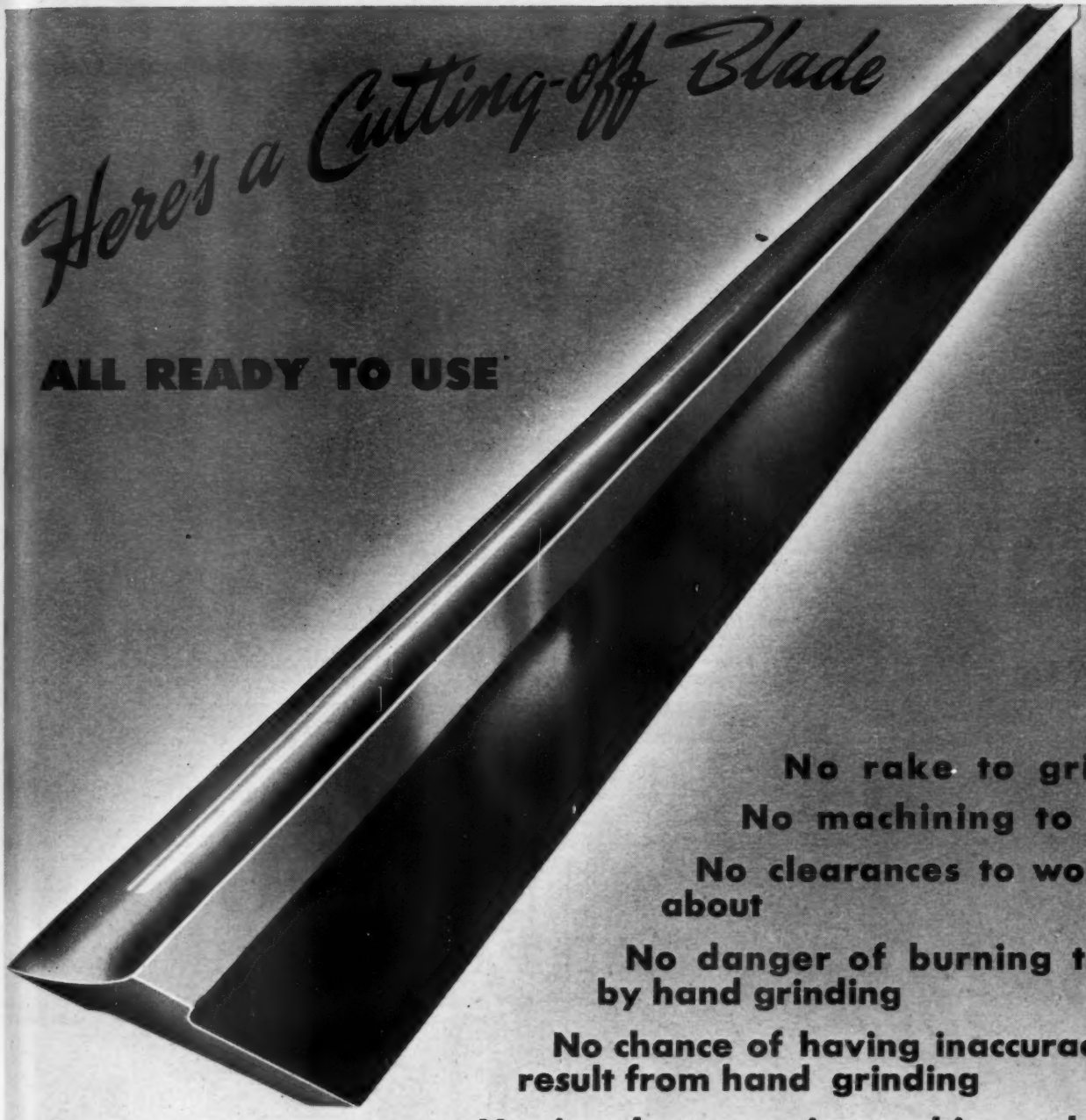

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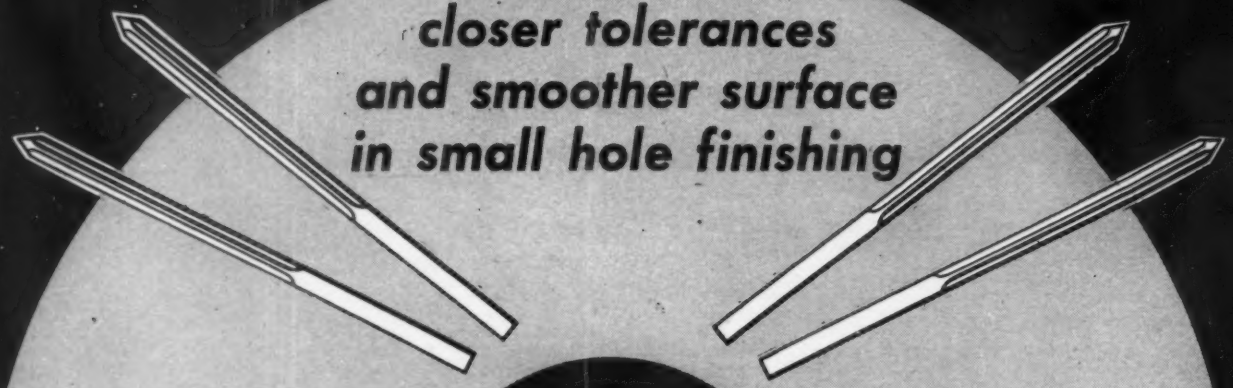

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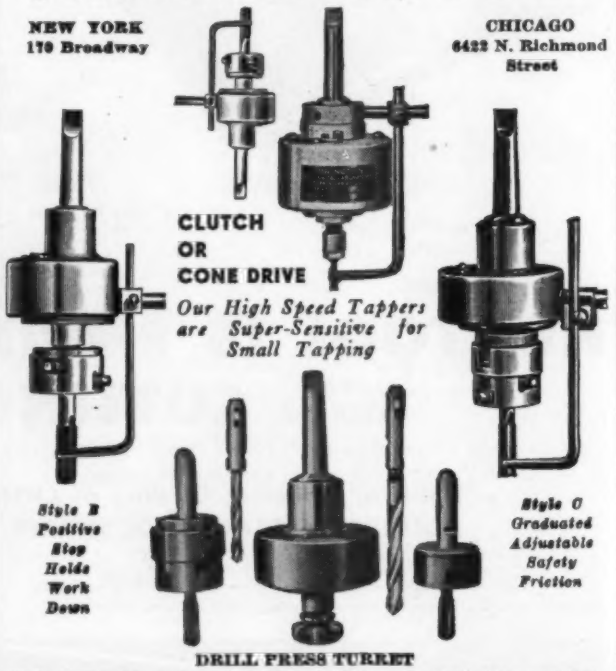

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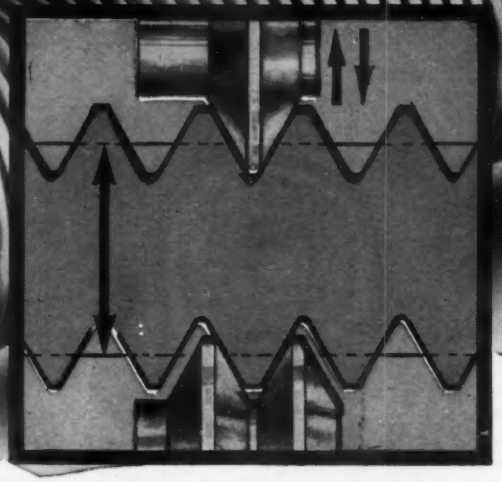

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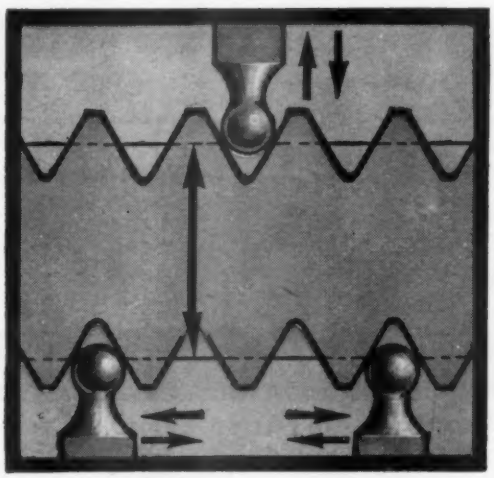

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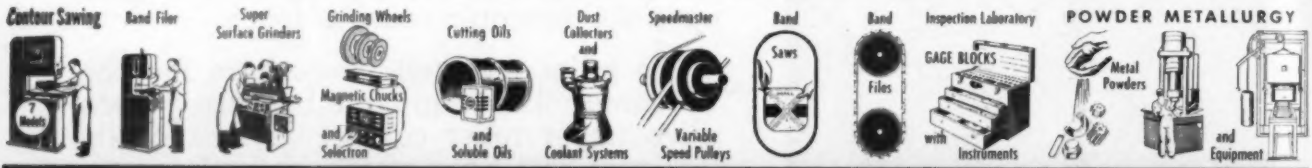

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Freedom is not given a people by a benevolent Government—it is something we must work to *get* and work to *keep*. Freedom of Enterprise has made America the world's most powerful and prosperous nation in both peace and war. Here we have the highest wages paid in the world, here we have developed the highest standard of living. Here we have not been subject to the repressions of a state-controlled economy, but have been free to develop individualism and self-reliance. Let's keep it that way.

We believe our returning soldiers will prefer a job with private industry where the "Sky Is the Limit" for their advancement—in direct proportion to their individual iniative, skill, and ability. Our system of Free Enterprise makes this possible, for it creates the vast volume of American production so necessary to attain and maintain high levels of employment.

In planning for the future, what can be more vital than to combat many plans that seek to abandon the system that has made this possible—Free Enterprise. Continuance of Free Enterprise, plus native American industrial skill and ability, will avoid the gaunt spectre of mass unemployment after the War.

But—unless we are willing to trade the time-proven Free Enterprise system for some substitute which will nullify individual initiative, progress, and freedom, we must speak up. We must explain its principles and advantages to those who may not understand them, because appreciation comes only from knowledge and understanding. If we fail to do this, the failure will be ours.

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FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
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SYNCRO specializes in solving various engineering and production problems. Let the broad, up-to-the-minute experience and ingenuity of SYNCRO engineers help you now — and after the war.

SYNCRO DEVICES inc.
3265 Bermuda Avenue, Dept. AM-114, FERNDALE, 20 MICH.

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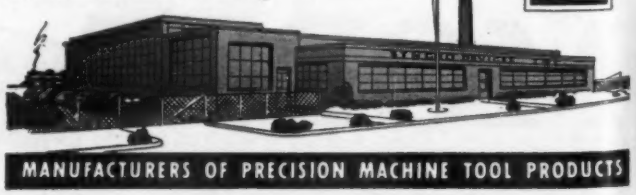


MANUFACTURERS OF PRECISION MACHINE TOOL PRODUCTS

NOW! METAL CHILLING on a Production Basis

(Above) Parts are fed into the cold chamber on two ring tracks.

(Above) View showing operator placing insert in cylinder block after chilling.

(Right) Standard Deepfreeze Cascade Industrial Chilling Machine with special loading and ejecting mechanism used for shrinking steel valve inserts.

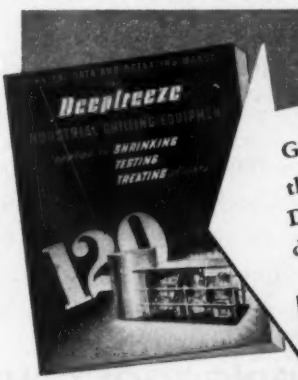
Deepfreeze Industrial Chilling Machine . . . . *saves $3675 per year* When Put on a Production Line for Shrinking Valve Inserts

A prominent automotive manufacturer obtained a total net savings of $3675 per year over dry ice by installing a Deepfreeze Cascade −120° F. Industrial Chilling Machine in his production line for shrinking steel valve inserts. A standard Deepfreeze machine was adapted for production chilling of these parts by adding a special automatic loading hopper just above the cylinder. The hopper revolves under electrical control, and distributes the parts downward to two ring tracks which feed into the top of the freezing chamber. The parts traverse through the track to the bottom, and are fed out through a special device which alternates the ejection of the inserts from either track. This ejector mechanism is foot or manually operated through a plunger by the operator.

By chilling at −120° F. these parts are shrunk .002″ for permanent shrink-fit assembly in a motor cylinder block. Production rate is 360 parts per hour, with 360 parts in the machine at one time. The cost of the dry ice method was approximately $4500 per year, as compared to the $175 electric current consumption of the Deepfreeze machine over the same period, plus $650 first year cost of depreciation, and interest on capital.

JOB FACTS

OPERATION—Shrink-fit assembly of steel valve inserts in motor cylinder block.
DIAMETER OF INSERT { 1.515 / 1.516
SHRINK OF INSERT—.002″ @ −120° F
MATERIAL—Alloy steel.
HARDNESS—50−60 Rockwell C Scale.
PRODUCTION—360 parts per hour.
FORMER METHOD—Used dry ice in two boxes. Cost approximately $4500 per year.
MACHINE—Deepfreeze Cascade −120° F. Industrial Chilling Machine with special loading hopper and ejector mechanism.



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Deepfreeze

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Division of Motor Products Corporation, Detroit, Michigan

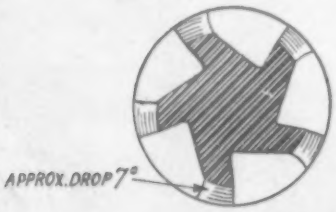
SHARP PRACTICE!

Good cutting tools deserve to be sharp . . . and it takes no more time to sharpen them right than it does to sharpen them wrong.

That universally used small tool, the Countersink, is a perfect example . . . **correctly** sharpened, its productive output is increased —its useful life extended.

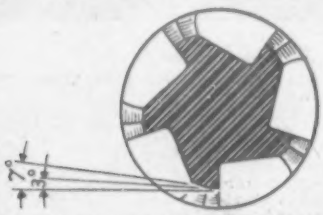
The right way to sharpen a Countersink is illustrated and described on this page. There's nothing tricky or difficult about it . . . Simply read, study the diagram and remember that a dull or incorrectly sharpened Countersink is a net loss.

Regardless of the type of countersink (pilot or self-centering) its cutting edges are either ground cam relief or profile ground. Gairing countersinks are always furnished with ground cam relief flutes.



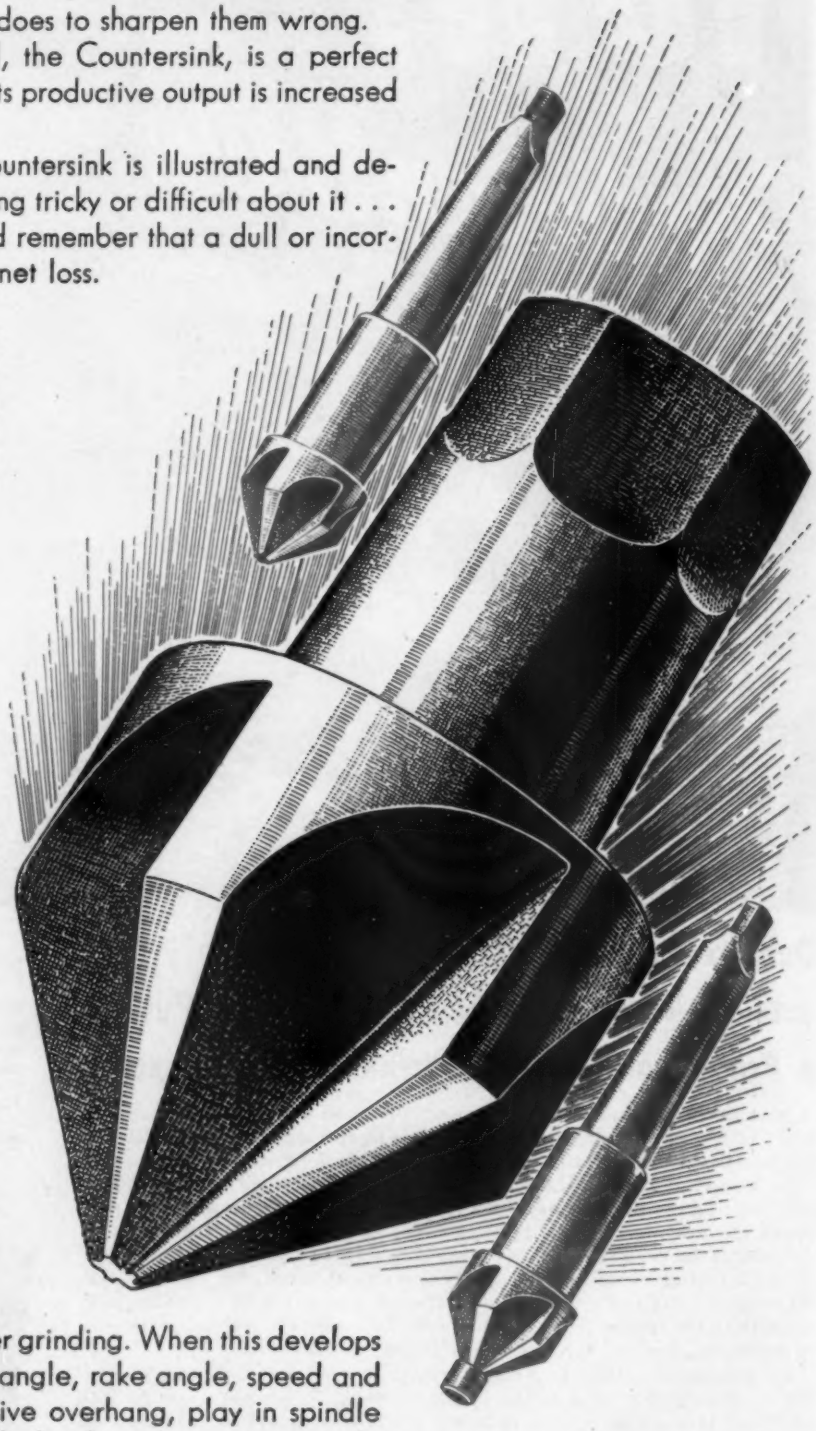
CAM RELIEF SHARPENING

1) Follow the original cam relief **or**
2) grind the face of the flute.



PROFILE SHARPENING

Always keep the angles as close as possible to the original flute design—Primary Land 3 degrees, Secondary Land 7 degrees.



Chatter may be caused by improper grinding. When this develops check insufficient end cutting edge angle, rake angle, speed and feed not in proper relation, excessive overhang, play in spindle bearing. For countersinking in tough, hard steel use countersinks with fewer flutes. Provide ample chip space in web.

THE GAIRING TOOL COMPANY, Detroit 32, Michigan

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Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools

GAIRING FOR A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS

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That's typical of the important part P&H Trav-Lifts are playing in war production. And everywhere, there is increasing recognition of what modern materials handling equipment can do in speeding production, eliminating worker fatigue, cutting costs.

P&H Trav-Lift Cranes provide an extremely flexible handling service. They enable you to move any type of load from any given point to any other within the area they serve, without rehandling. Available in sizes up to 15 tons capacity with either cage or floor control. Literature on request.

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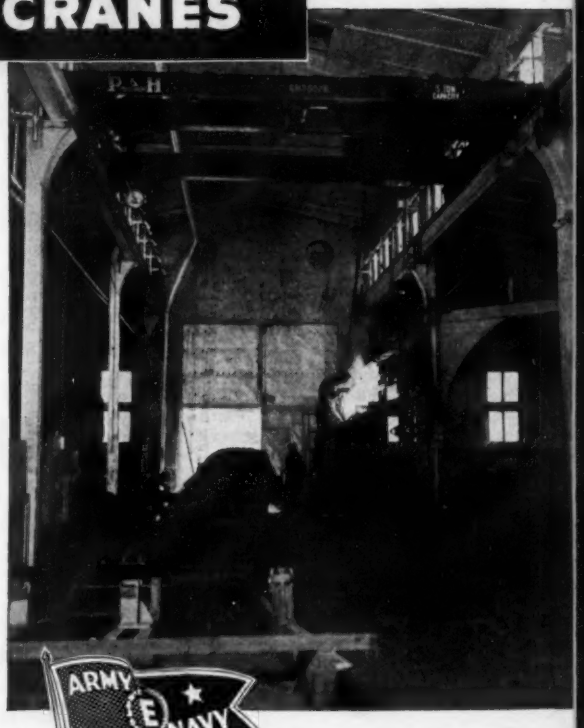


ARMY E NAVY

A new star has been added to P&H's award for excellence in war production.

TOOLS THAT OFFER NO "CONVERSION" PROBLEM

The same O K SYSTEM of Metal Cutting Tools you now find such a help in meeting war production schedules will fit into your post-war set-up like a hand in a glove! Their correct design and extreme flexibility will put them to work on any metal cutting job your peace time program may demand. Money put into such equipment is a *long range* investment. And that is why careful planners — men whose foresight exceeds their "hindsight" — have long been replacing outmoded cutters with modern O K Metal Cutting Tools.

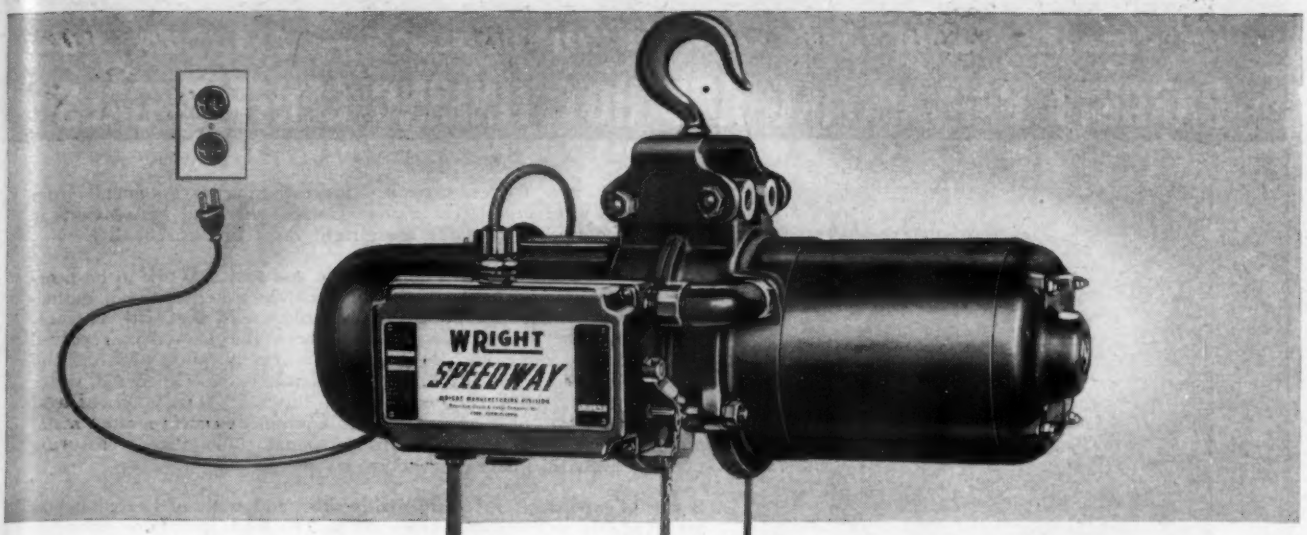
O K Single-Point Tools embody various locking designs. In some, the bits are held in mated serrations; in others, round-shank bits are locked in a drop seat. In others, the locks are still different. The bodies, or holders, are made of drop-forged alloy steel and the bits may be had in high speed steel or tungsten carbide tipped.

As with the Single-Point Tools, the blades of O K Milling Cutters and similar tools are separate cutting units; the bodies are of drop-forged alloy steel. The blades are driven into serrated mating slots. There they lock automatically and positively, without pins, wedges or set-screws; yet they are instantly adjustable in line of wear. All O K Tools SAVE HIGH SPEED STEEL!

"O K"
FOR EVERY
METAL CUTTING
JOB

THE O K TOOL CO., SHELTON, CONN.
Originators of the inserted-blade principle

THE TRADE OK MARK **SYSTEM**
OF INSERTED-BLADE METAL CUTTING TOOLS



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● The period of hurry—the need for faster production—won't be over with the war. Post-war work will impose its demands too. Get an Improved WRIGHT *SPEEDWAY* Electric Hoist as soon as possible for both now and tomorrow. Because it speeds up work and makes jobs easier, WRIGHT'S *SPEEDWAY* saves labor time, cuts handling costs—quickly pays for itself.

Women workers in war plants especially appreciate the push-button ease with which the WRIGHT *SPEEDWAY* is operated. The *SPEEDWAY* helps them maintain their morning vigor throughout the afternoon.

The *SPEEDWAY* Electric is a sturdy, light weight, cable hoist, designed for fast lifting on assembly floors and for general use. Designed with spur gear construction, magnetic control, and mechanical features found only in the more expensive production-type hoists. Yet it is priced economically low.

Talk to your WRIGHT distributor about *SPEEDWAY*'s advantages. He is listed in your classified telephone directory.

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AMERICAN CHAIN & CABLE COMPANY, INC.
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ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

WRIGHT *SPEEDWAY* HOISTS

A Quick, Smooth, Uniform coating — assured by
BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With these new Barrett machines for expelling excess metal from small parts after dipping in molten metal, faster and better work is assured which will pass the most rigid inspection for quality.

The method of handling work is simple and easy. Work to be processed is placed in a basket and submerged in a kettle of hot molten metal. When thoroughly heated, the basket with the work is transferred into the Barrett Centrifugal where the basket is revolved and the excess metal thrown from the work. A quick pick up and stop (from 2 to 3 seconds each) assures fast work. Then too, quick pick up snaps the excess metal from the work before centrifugal action comes into play. With Barrett Equipment excess molten metal can be quickly thrown off before the metal cools, thereby assuring smooth, even thickness of coating.

Barrett Centrifugals for Galvanizing with and without heated drums are available in capacities from 40 to 240 loads per hour handling from 5 to 100 lb. loads. For tinning, Barrett offers the #0 Centrifugal Machine, operated similarly to the Galvanizers. On threaded work, tinning is so exactly done that rethreading is unnecessary.

Barrett Galvanizers, combining convenience of operation with the utmost in speed and safety are developed to meet the requirements of actual use by men thoroughly familiar with this class of work. They are self-contained and occupy the minimum of floor space.

Send at once for full details of Barrett Centrifugal Galvanizer

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Designers and Builders of Centrifugal Machinery

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- LOW CHASER COST
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"H&G" DIE HEAD

See our Advt. on page 274 Nov. 11, '42 American Machinist

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Full Muffle Furnace

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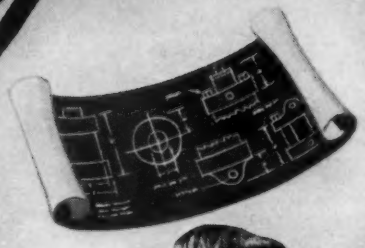

● Men responsible for *efficient production* in all types of industrial plants for a quarter century... have found T-J products "tops" for Tough Jobs!

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The Tomkins-Johnson Co., Jackson, Mich.

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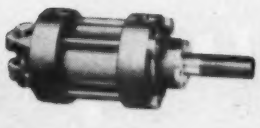

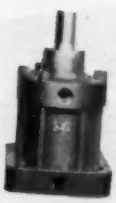

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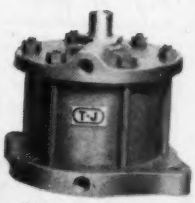
AIRCRAFT RIVITORS



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AIR CONTROLS

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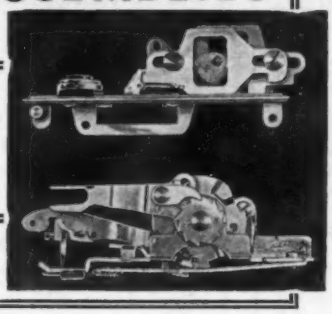

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Are you interested in a position that offers an ASSURED POST-WAR FUTURE as well as HIGHLY ESSENTIAL WAR WORK TODAY? We are looking for a foreman who can handle men and show a record of results in a modern welding and structural shop. Ours is a strong, long established company in Central Ohio with an enormous post-war business waiting when war contracts are completed and no conversion problems to delay the change-over.

Write today, giving your experience and references. Address

P-733, AMERICAN MACHINIST
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MACHINE SHOP FOREMAN

Wanted for Job with Post-War Future

Can you show a successful record for handling men and getting results in a modern machine shop? Are you interested in an assured post-war future combined with highly essential war work today? If so, the position is open as foreman of the machine shop in a strong, long established Central Ohio company that has an enormous post-war business waiting as soon as war contracts are completed and no conversion problems to delay the change-over.

Write today, giving your experience and references.

Address P-732, American Machinist
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WANTED — TOOLMAKER

who has had enough experience to take charge of tool room on special machine tools, jigs, fixtures, and gages, for our own plant. Excellent post-war opportunity for man who desires to get connected with a progressive concern established in 1933. Factory located on beautiful Lake Shore Drive, in southwestern Michigan. Give all details and salary expected in first letter.

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Permanent positions. Excellent working conditions. Experience in pump work preferred but all applicants will be considered.

WARREN STEAM PUMP CO., INC.
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Superintendent

for present and post-war position in New York City Area

This man to take full charge of plant which is manufacturing electrical conduit fittings. Must have knowledge of machinery maintenance and all phases of foundry work.

Applicants should give full details of background, experience and salary desired. All information will be held in strictest confidence.

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WANTED SUPERINTENDENT

for Turret Lathe Division, Warner & Swasey No. 4 or equal. Must know feeds and speeds. Man with ability who could eventually qualify as Factory Manager. Excellent Post War Prospects.

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POSITIONS VACANT

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense work by old established company in Central West; give experience and full particulars. American Machinist, P-667, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL MAKERS for defense plant in Central West; give experience and full particulars. American Machinist, P-668, 520 N. Michigan Ave., Chicago 11, Ill.

MACHINE DESIGNER WANTED—Experienced on the design of special machinery and machine tools. This is an excellent opportunity for a first class man interested in a steady position in New England, only men 35-55 with a record of successful achievements will be considered. In replying furnish complete information preliminary to a conveniently arranged interview. American Machinist, P-724, 330 W. 42nd St., New York 18, N. Y.

DESIGNER WANTED—We have an opening for a good small tool designer and it offers splendid opportunity for advancement. If you are interested give full particulars regarding age, salary excepted and experience. American Machinist, P-728, 330 W. 42nd St., N. Y. 18, N. Y.

MECHANICAL DRAFTSMAN, for layout work on cans for automatic machines; should be good mathematician and careful worker, preferably over 50 years old. To the right man a well paid and permanent position is offered. American Machinist, P-729, 330 W. 42nd St., New York 18, N. Y.

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For old established business employ nine hundred in the building of me and heavy high grade machinery.

Location New York State. Excel working condition that have prevailed many years combined with a modern and equipment should appeal to the we are looking for. He should an engineering background and prefer have practical machine shop training. should have the ability to plan and di quality production and secure results moniously and economically.

Business is now operating 100% on work but has wide line of nationally kn products for postwar markets.

This is not a temporary connection the war duration. It is a permanent ciation with a congenial and progres organization with unusual opportunities the right man able and willing to do part in meeting the postwar compet era for which we are preparing.

All correspondence will be considere confidence, therefore please give detail experience with whom, and for how l age, and other essential information.

P-740, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N.

POSITIONS WANTED

SUPERINTENDENT—Age 41—22 years i ing, production and assembly of light m ery and radio units. Experience as tool a maker and toolroom foreman enable me sist in the development of new products, and supervise the building of dies, fixture layouts for B&S screw machines, etc. Fa with subassembly setups and methods, and operation of assembly lines. Accusto setting up production schedules and co Have successful record in handling help securing quality production economically. ican Machinist, PW-738, 330 W. 42nd St. York 18, N. Y.

GENERAL MANAGER—Mature, Profit-m Dependable. Has successfully managed companies—two taken out of the red. Av for service shortly with medium-size co requiring reliable directing ability in ma ment, sales, finance and production. Ex experience machinery, tool, foundry and lines. American Machinist, PW-739, 3 42nd St., New York 18, N. Y.

MANUFACTURING EXECUTIVE seeks c tion with firm having post war pr Throughly capable of directing all operati connection with the manufacturing of m and light mechanical or electrical devi machines of a precision type. American M ist, PW-723, 330 W. 42nd St., New Yo N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "Gene formation Concerning Inventions and Pa and "Fee Schedule" sent without obli Established 1915. Lancaster, Allwine & Ro Suite 453, 815-15th St., N. W., Washi D.C.

WANTED

WANTED—1 good, secondhand straightside similar to No. 5-42 Bliss, 95 ton. Mercl Evans Co., 2035 Washington Ave., Phila.,

(*Continued on page* 283)

NEW INVENTIONS WANT

Mechanical and electrical devices for p war manufacture and sale. Either ideas, or improvements upon pr methods.

P. O. Box 217, Denville, N. J.

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2 or 3 Heald surface grinders ‡20 or State condition, serial ‡ and price livered f.o.b. New York.

J. H. H. VOSS CO.
785 East 144th St., New York 54, N

ADDITIONAL EMPLOYMENT ADVERTISING ON PAGE 283

IN STOCK!!!

LOCOMOTIVE CRANE

Ohio Locomotive Crane, 22½ tons, 8 wheel, 50' boom, ASME boiler, 150# pressure. PRICE: $9000.00.

GRINDERS

#2 Cincinnati Centerless Grinder, Serial #H-2055-Y.

24" x 120" Landis Universal Cylindrical Grinder, motor drive, perfect condition, rare bargain.

& Whitney 14" x 36" Vertical Surface Grinder, ll bearing spindles, belted motor drive, 10" x 36" gnetic chuck.

2 and No. 3 Brown & Sharpe Cutter Grinder. es, double end Disc Grinder, 18 discs.

ld 16" Rotary Surface Grinder #255, motorized. Brown & Sharpe Universal Cylindrical, belt ive.

GEAR MACHINERY

#13 Fellows—Late type.

#13 Brown & Sharpe Spur & Bevel Gear Cutter.

National Broach 3" x 18" Gear Finisher, like new.

DRILLS

four-spindle #3 M.T., power feed to each ndle, high speed, ball bearing, sliding head, 24" ing, table working surface 26" x 63", motor ven by 5 H.P. A.C. 60 cycle, 3 phase motor, rfect condition.

ee four-spindle #2 M.T., high speed, ball aring Drill, rebuilt.

ry & Wright six-spindle #3 M.T., 7⅛" over-ng, high speed ball bearing, motor driven Drill

No. 3 three-spindle, high speed, ball bearing, ding head Drill Press, 8" overhang, #2 M.T.

d-Gifford 2-spindle, No. 2 M.T., high speed, ll bearing Drill Press, motor drive (2).

Allen-single-spindle, high speed, ball bearing, 8" overhang, #2 M.T., table working surface 14 x 14.

Avey-matic #2 High Speed, Ball Bearing Sensitive Drill Press, motor driven, power feed quick return.

LATHES

Putnam 26" x 12' Heavy Duty Screw Cutting Engine Lathe, QCG.

LeBlond 21 x 10 Quick Change Gear Lathe, motorized.

Reed 22" x 16' Plain Change Lathe, Light Pattern.

Rockford 14 x 6 Quick Change Gear, motorized.

Champion 18" x 12' Quick Change Gear Lathe.

Superior 18" x 8' Heavy Duty Quick Change Gear.

LeBlond 14" x 6' Toolroom Quick Change Gear Screw Cutting Lathe with taper attachment, drawbar collets and two chucks.

Rahn-Mayer 18" x 10' bed Standard Change Gear Screw Cutting Engine Lathe. Price: $850.00.

American 16 x 8 Quick Change Gear, motor drive.

Seneca Falls 14 x 6 Quick Change Gear, motor drive, taper attachment, collets.

Reed-Prentice 20" x 10' Quick Change Gear, motor drive, taper attachment.

LeBlond 21" Heavy Duty x 8' bed geared head, motor drive Quick Change Gear Engine Lathe with taper attachment, very late model.

Logan Model #450 Turret Lathe, new, ⅝ capacity, immediate delivery.

TURRET LATHES

Jones & Lamson 3 x 36 Chucking Machine, Serial #15,451, single pulley drive.

Jones & Lamson 3 x 36 Chucking Machine, Serial #15,347.

Warner & Swasey 1¼" capacity Hand Screw Machine, 6-hole round turret with automatic bar feed, with collets and cross slide, arranged motor drive with Turner Uni-drive and motor. Price $850.00.

Warner & Swasey #6 Turret Lathe, power feed to turret, geared friction head, full set of collets, oil pump and piping, steel pan bed, serial over 280,000, perfect condition, available immediately.

HAMMERS

1—1100# Bement & Miles Steam Forging Hammer.

No. 6½ Rochester, High Speed Riveting Hammer.

No. 5½ B Rochester High Speed Riveting Hammer.

High Speed Riveting Hammers—4A, 3A, HD, 2A, HD, 1AA.

50# Fairbanks Blacksmith Power Hammer.

BORING MILLS

24" Bullard Vertical Turret Lathe Rapid Production, motor drive.

3½" Rochester Floor Type Horiz. Boring Mill, M.D.

DRILLING MACHINES

Fox No. 15 H Multiple Spindle Drilling Machine, hydraulic feed, drilled for 54 spindles and equipped with 32 No. 1 Morse taper spindles, 43" x 23" rectangular head. Serial No. 1065, motor driven, 10 H.P., 3 phase, 60 cycle, 440 volts.

Fox. No. D31 mult. spindle drill. mach. Drilled for 32 spindles and equip. with 16 No. 2 Morse taper Pwr. fd., 17" x 34" bd. Ser. No. 626, m.d. 10 H.P., 3 ph, 60 cy, 220 v.

Natco No. 12 mult. spindle drill. mach. Single pulley, B.D., Drilled for 16 Spindles and equip. with 6 No. 2 Morse taper. Power feed.

Avey 4-spindle No. 3 M. T. Power Feed to each spindle, High Speed, Ball Bearing, Sliding Head, 24" swing Drill Press, with screw elevating table, working surface 20 x 63, motor driven by 5 H.P., 3 phase, 60 cycle, 440/220 volt motor and push button control, complete with oil pump and piping. In perfect condition. Bargain!

SHAPERS

26" Cincinnati Triple Geared Shaper, Friction Drive.

20" x 20" x 36" N-B-P Shaper-Planer, Arranged Motor Drive.

16" Davis Single Pulley Drive thru gear box, with motor A.C. 60 cycle, 3 phase, 220 volt.

20" Gould & Eberhardt High Duty, Back Geared, Crank Shaper, motor driven (2)

24" Gould & Eberhardt High Duty, Back Geared, Crank Shaper, motor drive.

COIL STRAIGHTENERS

No. 5-18⅛ Littell Single Rack & Pinion Feeding and Straightening Machine takes stock 18⅛" wide up to 10 gauge.

MILLING MACHINES

Cincinnati #3 Vertical Milling Machine, High Power, Power Rapid Traverse, Motor Drive.

Ohio No. 34 Heavy Universal Milling Machine, M.D.

No. 1½ Valley City Plain Miller, belt drive.

PRATT & WHITNEY 2" Spline Duplex Miller.

1—No. 3 Cincinnati Plain Miller, single pulley drive, high power. Serial #A-889-H.

1—No. 4 Cincinnati Plain Miller, single pulley drive, high power. Serial #4-335-K.

1—No. 4 Cincinnati Plain Miller, high power. Serial #A-703-D.

1—No. 5 Cincinnati Plain Miller, high power. Serial #4-525-N.

1—No. 5 Cincinnati Plain Miller, high power. Serial #A-603-A.

Presses, Brakes and Shears

Guillotine Bar Shear—Pels 2½" cap.

No. 132 Bliss 14 ga. 18" throat slitter.

No. 232 Bliss 12 ga. 18" throat slitter.

#21 Bliss O.B.I. Press, 2" stroke.

Truesdale #19, similar Bliss #19.

Baxendale No. 4 and No. 3, comparable Bliss #20 and #19 O.B.I.

Manville #4 Perforating Press with roll feeds.

Bliss #2 Back Flywheel 1½" stroke (8).

Bliss #30 Arch Press, 2½" stroke.

Rockford #2 O.B.I. Press, weight 1800#, 2" stroke.

E. W. Bliss #18 Open Back Inclinable 1½" stroke (3).

E. W. Bliss #19 O.B.I., motor drive (2).

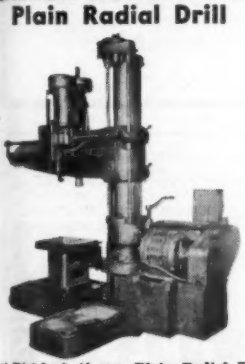
Hibbard #6 Open Back Inclinable Plain Flywheel Power Press, motor drive, 3½" stroke, bolster 18 x 30, shut height 12½", weight 4500#.

E. W. Bliss #3A Horn Press, Stiles type, back geared, motor drive, 3½" stroke, less table.

12—6-SPINDLE AUTOMATICS—LIKE NEW

New Britain #61—1⅝" 6-spindle Automatics—3 equipped for bar work—12 equipped for second operation work. Machines are about 15 months old. Now available for immediate delivery. Equipment includes motors, chucks, collets, and tooling. Write, wire or phone Main 6347.

Cincinnati-Bickford 4' Arm Plain Radial Drill



nati-Bickford 4' arm Plain Radial Drill, mo-drive, No. 5 M.T. in spindle, column and box mounted on 12" raising blocks, oil ved base, plain box table, perfect condition. ilable immediate delivery.

PLANERS

72" x 72" x 18' table; 2 heads on rail, 2 heads.

INNATI 30" x 30" x 10' table, M.D.

AM 48" x 48" x 12' table, M.D.

26" x 26" x 8' Double Housing Planer, single on cross rail, belted motor drive.

nati 24" x 24" x 6' table, belt drive, single ulated swivel head on cross rail.

RADIAL DRILLS

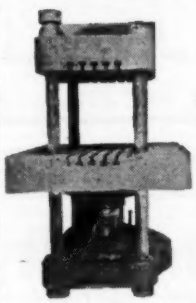
nati-Bickford 4' arm 11" round column, #5 motor drive to gear box.

rd 7' arm, 15" round column, gear box motor ve.

an 6' arm, 15" round column, #5 M.T. le pulley drive thru quick change gear box; nged for motor drive.

PROFILERS

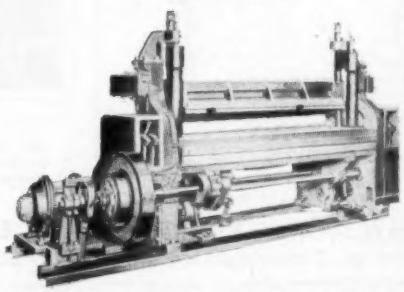
W. No. 12 2-spindle motorized Profiler. Table x 15" equip. with 6" rais. blocks, and 5 H.P., ., 60 cycle, 220 V. motor — Turner drive ted and wired to push button control—rebuilt guaranteed.



200 TON HYDRAULIC PRESS

American Car & Foundry upmoving ram; 4-column type; distance between columns 35" right to left, 24" front to back; daylight 34½"; minimum die space 22"; platens are made with 5 tee slots; bottom platen area 49" right to back; cylinder 13⅛" diameter; 24" stroke; 2500# pressure capacity.

NIAGARA #98



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6' x 14 gauge capacity. Ar. M.D.

Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) ⅜" to 1⅝", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

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TOOLROOM EQUIPMENT such as Drills, Reamers, Milling Cutters, etc.
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1—BAUSH Heavy duty multiple spindle drill, 12 spindles 2½" diameter; #4 Morse taper; Reliance 30 H.P.D.C. motor 400-1200 RPM, 230 volts. Minimum center distance between socket holes 2¾". Weight approx. 20 tons.

1—PRATT & WHITNEY duplex Milling Machine; table feed 72". Completely motorized including table rapid traverse.

1—INGERSOLL 2-spindle Continuous Vertical Milling Machine; clearance between table and spindles 56"; 72" circular table. Completely motorized 440-60-3. #1—OPA Class.

1—20 Ton V52 VERTICAL BROACH, hydraulic pull, American Broach & Mach. Co., Ann Arbor, Mich.; 48" stroke; 84 x 34" base. #2—OPA Class.

1—#10-D MOLINE Hydraulic Boring & Drilling Machine (Hole Hog). Oil gear feed by 5 H.P. motor; 20 HP on spindle drive. #3—OPA Class.

Individual photos supplied to interested parties.

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24 H.S. Gould & Eberhardt Gear Hobber, M.D.
9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows—11½" hole, M.D.
No. 6 Fellows Gear Shaper
Cimatool gear chamfering, M.D.
Lees-Bradner Gear Grinder

TURRET LATHES—AUTOMATICS

No. 2L Gisholt—Bar Equip. 1940.
3 5/16" Model B—4-spindle Nat. Acme, M.D.
Goss & DeLeeuw 6" x 6¾"

MISCELLANEOUS

36" Bullard Vert. Tur. Lathe; NEW 1940
No. 3K Milwaukee Vert. Mill., M.D., Rot. Table
4¼" x 12" Pratt & Whitney Thread Millers (2)
36"x36"x8 Woodward & Powell Planer Rev. M.D.
36"-48" x 12 Cinc. Planer, Rev. M.D. 4 Hds.
No. 2 Lapointe Broach
21-SA Cochrane-Bly H. S. Saw
No. 171 Bliss Stiles Sprue Cutter
12" Lamb & Nash Type K Slitter
10" x 120" Norton Grinder—M.D.
12"-18" x 30" Monarch Lathe—New 1939

DRILLS

New Delta Drilling Equipment
No. 2 Avey 2-spindle drills with Aveymatic Feed (2)

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Machine new in 1936. Equipped with 34" x 10". Magnetic Chuck and demagnetizing attachment. Machine in excellent condition. May be seen under power.

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No. 00 Brown & Sharpe Automatics
4-spindle No. 2 Allen Drill
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2¼" J & L, Bar and Chucking

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SEBASTIAN 12" x 8' quick change, Gd. Head
ROCKFORD 16" x 6" Lathe
AMERICAN quick change
AMERICAN 16" x 8'
GREAVES KLAUSMAN 18" x 8'
DRAPER 27" x 16' Geared face plate
NATIONAL 40" x 18' Geared face plate
JONES & LAMSON 2" x 24", 3" x 36" turret lathe
WARNER & SWASEY 1", 1½" and 4" turret lathe

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BROWN and SHARPE Hand Millers
KEMPSMITH No. 1 33
GARVIN No. 2 Universal with Divide. Hds., M.D.
PRATT and WHITNEY No. 3 Plain table 9" x 40"
PRATT and WHITNEY No. 12 Production Millers
FOX MILLER, power feed.
INGERSOLL Slab Miller Openside

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NATIONAL ACME Four Spindle automatics ¾", and 2¼" capacity
CLEVELAND Single Spindle Automatic ⅝" capacity
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REED-PRENTICE 2" Geared Head Turret, with cross-slide feed to turret

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BINSSE 2½" Bar Horizontal Boring Mill
BULLARD 30" Vertical Boring Mill with hexagon turret.
GIDDINGS & LEWIS 3" bar horizontal boring Mill, Cable type
BICKFORD 5" vertical boring mill with 2 vertical heads
COLBURN 50" boring mill with 2 vertical heads

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1 SPRINGFIELD 14" Crank Shaper
2 Shapers
1 Shaper
1 HENDEY Midget Planer 12" x 12" x 2'
1 POWELL 36" x 36" x 8' Planer
1 SELLERS 36" x 36"x 9' Planer, 4 heads
2 GOULD EBERHARDT Shapers—18" and 24"
1 KELLY 24" Shaper

GRINDERS

1 BULLARD 24" Vertical Rotary Surface Grinder similar to Blanchard No. 16
BROWN & SHARPE #3 Universal Grinder
BROWN & SHARPE #13 Cylindrical Grinder
1 BROWN and SHARPE No. 3 Planer Type Surface Grinder with 30" Magnetic Chuck
1 HEALD No. 55 Internal Grinder
1 LANDIS 20" x 90" Universal Cylindrical Grinder

DRILLS

1 SNYDER 36" sliding head drill press
1 WELLS multiple spindle drill press
1 FOSDICK 3' Radial Drill
1 DRESES and MUELLER 3½ Radial Drill, M.D.
1 PRATT and WHITNEY No. 12 Multiple spindle Drill
1 BAUSCH 12 spindle Multiple Drill to drill 12-1½" holes
1 DETROIT 5 spindle Horizontal Drill

PRESSES

NIAGARA #26 Arch Press
ADRIANCE #406 Arch Press
ADRIANCE Double-Crank Perforating Presses with auto roll feeds (expended metal)
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CONSOLIDATED 72" Double Crank Power Press, twin drive, power adjustment to ram.
BLISS Nos. 1, 1½, 3 and 4 Toggle Draw
BLISS Nos. 1, 2, 4B Double Crank Presses
BLISS No. 16, 39 Horning Presses
CONSOLIDATED No. 24, and No. 84 Horn Presses
CONSOLIDATED 36" wide Ram Double Crank Horn Press
WATERBURY FARREL Eyelet Presses
WATERBURY FARREL Dial Feed Cartridge Shell Presses, all long stroke
WATERBURY FARREL Horizontal Rack and Pinion Shell Reducing Presses
BAIRD No. 3 Tandem Press with Roll Feed

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YODER 20 HEAD ROLL FORMING MACHINE SUITABLE FOR AIRCRAFT WORK
YODER G36 Gang Slitters, M.D.
BLISS 30" x 14 Gauge Shears
NIAGARA Circle Shears
BLISS 225A Gang Slitters
TOLEDO 52" Gang Slitter
LAMB & NASH 72" Gang Slitter
BRODEN 5" x 8" Wire Flattening Mills
OHL 10' x 10 gauge Press Brake
VERDES, KAPPES 60" Press Brakes
DREIS & KRUMP 10' x 10 gauge Power Box and Pan Brake
PELS, No. 13 Combination Punch and Shear, with Coper, M.D.
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Cam making machinery complete equipment for all types of cams

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#O FOSDICK Horizontal Boring, Drilling & Milling Machine, M.D.
ROCKFORD Horizontal Drilling & Boring Machine 3⅜" spindle
4' HAMMOND Hi-Speed Sensitive Radial Drill, M.D.
90" PRATT-WHITNEY Spur Gear Cutter
15" GLEASON Bevel Gear Generator
16" BILGRIM Gear Generator
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42" PUTNAM Double End Car Wheel Lathe, M.D.
PUTNAM Double End Axle Turning Lathe
#1 N.B.P. Car Wheel Lathe
#3-B MILWAUKEE Plain Miller
#2 CLEVELAND Plain Miller
#10 NILES Vertical Milling Machines
#6 BECKER Vertical Milling Machine
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6" x 6" RACINE Power Hack Saw, M.D.
12" x 12" ACME Power Hack Saw, M.D.
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48" x 48" x 20' PATCH Planer, 4 heads, 230 volt D.C. Rev. M.D.
36" x 36" x 8' GRAY Planer, 230 volt D.C. Reversing M.D.
24" x 24" x 6' WHITCOMB Planer, 230 volt D.C. Reversing M.D.
36" Rotary Planer, M.D. Turntable
#3 WARNER-SWASEY Turret Lathes, 3⅛" bar capacity
#1 L&A Multiple Punch, 100 Tons, 72" between housings
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SCHULTZ - NAUMANN Beam Shear, 20", 60 lb. and smaller
60" Throat, 8" x 1 1/16" LONG & ALSTATER Shear
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4" LANDIS Pipe Threading Machine
6" BIGNALL - KEELER Duplex Pipe Machine
10" Standard Pipe Threading Machine
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#O BAKER Keyseater, M.D.

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3—#32 Van Norman Duplex, M.D.
1—#5 Cincinnati High Power
2—#4 Cincinnati High Power
1—#3 Cincinnati Vertical
1—#2 Cincinnati Vertical
1—#2 Cincinnati High Power
5—#2 Cincinnati Plain, Cone
1—#3 Garvin Duplex

TURRET LATHES & SCREW MACHINES

1—4¼" Bardons & Oliver Universal Lots of Equipment
1—3"x36" Pratt & Whitney Universal Lots of Equipment
1—1½" Cap. Southworth, Power to turret
1—2¼" Bar Cap. Mulholland
1—26"x4½" Libby Turret Lathe
1—1⅝"x7" 6 Spindle New Britain

RADIAL DRILLS

1—5' Arm Cincinnati-Bickford Type 11" Round Column
1—4' Arm Cincinnati-Bickford Type 11" Round Column
1—6' Arm Niles Universal Arm

LATHES

1—16"x8' Monarch Geared Head. I in Base
1—14"x6' Hendey, Taper and Draw
1—14"x6' Leblond
1—34" Fifield Triple Geared

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11" GLEASON BEVEL GEAR GENERATOR

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207 Centre Street — New York 13, N

MISCELLANEOUS MACHINES

48" x 36" x 16' Gray Dbl. Housing Planer, 3 hds., 15 HP, A.C. m.d.
28" x 28" x 6' Gray Planer, 1 hd. on rail, m.d. with 5 HP, A.C. motor
3" bar Morris Horiz. Boring Mill with 4 boring bars, m.d.
3' Carlton Sensitive Radial Drill, 3 M.T. hole
6' Niles Plain Radial Drill, gear box m.d., 15 HP motor, rebuilt
12" x 18" Cinci. Plunge Cut Grinder, m.d., accommodates wheels up to 9" face, rebuilt.
Gisholt Tool Grinder, arranged for m.d.

STRONG, CARLISLE & HAMMOND CO.
1392 West 3rd St., Cleveland, Ohio — 2832 East Grand Blvd., Detroit, Mich.

GRINDERS

50"x28' Norton Roll, M.D.
Norton 12x18", M.D.
Landis 14x52", S.P.D.
Modern 12x48", M.D.
Heald #72A Sizematic, M.
B. & S. No. 10, 11, 14.
P. & W. 14", 18", B.B.
Hanchett 10' Face, M.D.
No. 79 Gardner, 72", M.D.

AARON MACHINERY
45 CROSBY STREET NEW YORK

BORING MILL, 36" Gisholt, 1 head, S.P.D.
DRILL, Heavy Samson Arch Frame, No. 5 M.T.
GEAR PLANER, Bevel 54" Gleason, M.D.
GRINDER, Cylindrical 12" x 72" Cincinnati
HAMMER, Steam Forging 1100 lb. N-B-P
MILLER, Plain High Power 3-S Cincinnati
MILLER, Universal Geared Head 1-B Milwaukee
MILLER, Vertical Plain 5-C Becker
PLANERS, 48" x 48" x 12' Gray, 4 heads, M.D.
PRESS, 95-B Toledo, bed 55" x 54", stroke 3"
PRESS, Hydraulic 1000 ton Wood, platen 42" x 9', stroke 18", daylight 36", accumulator, etc.
PUNCH, No. 4 Chamb, throat 36", 1¼"-1"
TURRET LATHE, 3-A W & S, H.S. 3-11/16"
TURRET LATHE, 26" Libby "C", H.S. 7⅛"
TURRET LATHE, 34" Gisholt, H.S. 4¼"
SHEAR, Squaring 44" x 3/16" American, M.D.
STRAIGHTENER, 19-roll Newbold, cap. 48"x16ga.
STRAIGHTENER, tube Torrington, cap. ¼"-⅝"
STRAIGHTENER, plate H & J 12-roll, cap. 34" x ⅛"

Lang Machinery Company
28th St. & A.V.R.R. — Pittsburgh 22, Pa.
Phone Grant 3595

Two—⅞" CONE FOUR SPINDLE MATIC SCREW MACHINES, arran motor drive; one equipped with c slide, the other a threading spi

One—1¼" CONE FOUR-SPINDLE MATIC SCREW MACHINE, arran motor drive without motor. equipped with auxiliary slide.

One—1¾" NATIONAL ACME MO FIVE-SPINDLE AUTOMATIC SCR CHINE, arranged for motor Equipped with threading spindl

J. L. LUCAS & SON,
BRIDGEPORT 5 — CONNEC

UNUSUAL VALUES

Bolt Cutter 1" capacity, 3 spindle
Brake Robinson 5" toggle
Compresser, 120 Schramm, portable
Drill, new 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Press, 20" three spindle Barnes
Drill, six-spindle Henry & Wright, 12" overhang
Drill, two spindle sensitive, #1 Morse taper
Grinder, #20 Bryant deep hole internal
Grinder, 60" plate
Grinder, Sellers Tool
Hammer, 50# Bradley helve
Lathe, 14"x12' Lodge-Shipley grd. hd. s.c. mtr. dr.
Lathe, 24" x 18' Steptoe-McFarlan
Pipe Machine, 6" Merrell
Press #8-7 Zah-Hahnemann straight side grd.
Press, #1 open back inclinable, motor drive.
Punch & Shear, two ½" capacity
Threading Machine, #0 Webster & Perks
Turret Lathe, L & D brass, cross slide turret
Vacuum Cleaners, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

TURRET LATHE

Warner & Swasey No. 2A, 3A
Brown & Sharpe No. 0,
Brown & Sharpe Autom #00, 0 2G
Libby 26", 8" hole.

CANAL MACHINERY CO
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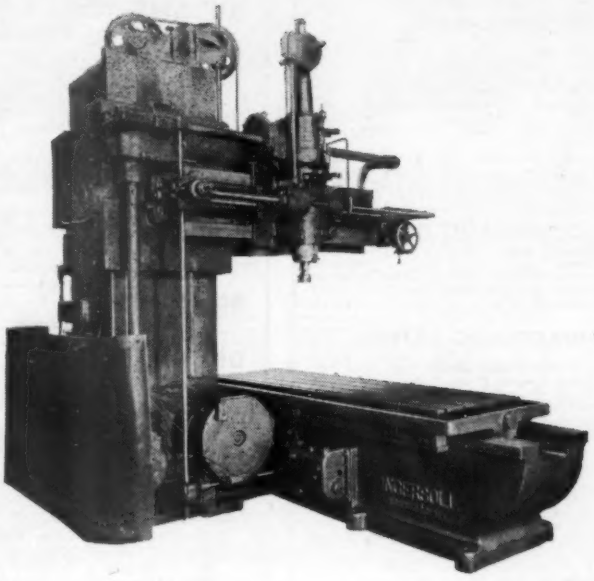
INGERSOLL OPEN SIDE VERTICAL MILLE



30" x 48" x 96" INGERSOLL OPEN SIDE VERTICAL MILLING MACHINE

Table working surface 29" x 96".
Spindle vertical feed 24".
Table travel 96".
Maximum distance spindle to column 44".
Adjustable rail.
Power rapid traverse.
Arr for motor drive.
Weight about 24,000 lbs.

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This machine is available for inspection at any time.

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QUALITY TOOLS IN STOCK

Automatic, 1⅝" No. 55 National Acme M.D.
Automatic, No. 16 Gisholt Simplimatics
Chuckers, 4½" Gridley Model H, 4 spindle
Chuckers, 7" Baird 6 spindle
Cylinder borer, 3⅞" bar Beaman & Smith, horizontal
Boring Mill, 3" bar Universal, No. 3A
Boring Mill, 42" Bullard vertical
Broaches, Nos. 3 & 4 J. N. LaPointe
Compressor, 550 cu. ft. National 3 cylinder vertical
Compressor, 1400 cu. ft. Sullivan WN3
Drill, W. F. & J. Barnes vertical boring, reaming & drilling, hyd. feed
Drill, Multiple Nos. 11, 12 & 13 Nateo
Drill, 20" Barnes All Geared Self Oiling
Drill, Sensitive, 4 spdl. Edlund 2B, power feeds
Drill, Sensitive, 1 & 2 spdl., Henry & Wright, type B
Gear Cutter, 60", No. 5A Cincinnati spur
Gear shaper, ZI (No. 61) Fellows
Gear Hobber, No. 1 Lees Bradner Mfg.
Gear Hobber, No. 16 HS Gould & Eberhardt
Grinder, No. 3 Cincinnati universal
Grinder, No. 84 Gardner, 24" opposed spindle
Grinder, Landis 10" x 48", 12" x 36", 16" x 52"
Grinder, Landis 16" x 32" & 16" x 48" crankpin
Grinder, 20" x 50" Safety Emery Wheel surface
Grinder, 20" Gardner semi-auto. disc
Grinder, internal, No. 70 Heald
Lathe, 36" x 16' Putnam heavy geared Bod.
Lathe, 4" x 36" Lo Swing, hardened ways
Lathe, 8" Sundstrand Stub
Lathe, 14" x 19" Fay automatic
Lathe, turret, 26" Libby 4½" & 7½" hole
Lathe, turret, No. 3B Foster, 4½" hole
Lathe, 4" x 36", LoSwing, hardened ways
Miller, Type C Hall Planetary thread
Miller, No. 3 Turn Millers
Miller, Nos. 10 & 45, Productomatic
Miller, 30" Newton cont. rotary
Miller, 48" Oesterlein tilted offset
Miller, No. 1 Davis & Thompson cont. duplex
Planer, 24" x 24" x 6' Woodward & Powell
Planer, 36" x 36" x 16' Cleveland opendide, 1 rail and 1 side head
Press, No. 8-7 Zeh & Hahnemann str. side
Press, No. 33 Toledo arch
Press, No. 174 Consolidated Dbl. Cr., roll feed
Press, No. 796¼D Toledo, dbl. cr. toggle draw
Press, 3, 6 & 12 ton Fox Superflex, arbor
Punch, 1¼" x 1" Long & Alstatter, 12" throat
Riveters, Nos. 2A hy., 5½ B & 7B High Speed
Rolls, No. 1A Ajax taper forging
Rolls, No. R60 Yoder fender crown
Roll, Waterbury Farrel thread roller
Saw, 36" Newton cold
Saws, Nos. 12, 14 & 17 Higley cold 4" to 8"
Shaper, 16" Milwaukee
Shaper, 36" Morton draw-cut
Shaper Planer, 26" Lynd Farquhar openside
Shears, 8" x 8" x 1" Long & Alistatter angle
Shear, About 1½" Lewis, alligator
Slotter, 4" Garvin
Sprue Cutter, No. 180 Tessmer.
Swager, No. 6 HS Langelier
Threader, ¾" Economy automatic stud
Upsetter, 4" Ajax
Welder, 375 KVA Fisher Body projection
Wire Straightener, ⅜" x 3' Shuster

MISCELLANEOUS

Casing coiler, ¾" No. 319 Sleeper & Hartley
Spring Coiler, No. 5, ⅝" capy. Sleeper & Hartley
Hone, No. 211 Barnes
Lathe, Melling 6 cyl. crankshaft
Sand Mixer, Baker Perkins
Screw Driver, No. 61AA Bodine
Washer, Blakeslee metal
Threader, 1" Cleveland automatic double end
Gear checker, National Tool, for gears & cutters
Grinder, Cincinnati face milling cutter
Buffer, Hawes No. 575 for polishing
Die Casting Machine, A. C. Spark
Screw driver, Model C Detroit
Washer, Blakeslee, conveyor type

If you do not find the machine you need listed herein, mail us your inquiry and specifications. We may have or know of that very machine

Ask for Your Copy of Stock List No. 176

MILES MACHINERY CO., SAGINAW, MICH.

LATHES

36" x 30' LeBlond Grd. Hd. A.C. M.D.
26" x 14' Putnam Heavy Duty A.C. M.D.
24" x 12' Niles Heavy Duty, Q.C.

GRINDERS

#16 10" x 72" Brown & Sharpe Plain.
Fitchburg Spline Shaft Grinder.
Lees Bradner Gear Grinder.
Simplicity Piston Grinder.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.

PLANERS

42" x 42" x 20' Cincinnati Hypro 4 Hea
D.C. drive.
72" x 60" x 28' Pond 2 heads, Belt driv
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodward & Powell, 2 H

RADIAL DRILLS

2½' American Plain, M.D.
3' American Sensitive.
3' American Plain.
3' Cincinnati Bickford Plain Radial Dri
4' Carlton Plain Radial Drill.
5' Cincinnati Bickford M.D.

MISCELLANEOUS

#3 GH LeBlond Plain Heavy Duty, PR.
14" Niles Slotter.
1500# Bell Steam Hammer.
#4 Cincinnati Vert. High Power Mill, M

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217 East Second St., Cincinnati, O

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Mattison 14 x 60 Grinder. New 1938, Motors A.C. 220 volt, 3 phase, 60 cycle. Magnetic Chuck 60". Condition excellent.

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4' Universal Radial Drill, B.D.
26" x 14' Bridgeford Geared Head Lathe.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
50" G & E Gear Cutter.
24" Gisholt Turret Lathe, 6¼".
20"-24"-32" Shapers.
10' Bridgeport Knife Grinder.
36" Morton Draw Cut Shaper.
No. 2 Mitts & Merrill Keyseater 12" x 1¾".

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

PLAIN CYLINDRICAL GRINDERS

10" x 18" Norton Model A, motor driven.
#30A Brown & Sharpe, motor-inbase Dri
capacity 12 x 18.
24" x 36" Norton. Motor Driven.
12" x 96" Cincinnati. Motor Driven.

J. L. LUCAS & SON, INC.
Bridgeport 5 **Connecti**

MOREY
Dependable Used Machines

N.B.P. 96"x98"x16' Planer; 4 heads; DC variable speed M.D.; box table
N.B.P. 48"x36"x14' Planer; 3 heads; box table; belt drive
GRAY 24"x24"x6' Single Head Planer
LUCAS #31, 3" bar Horiz. Boring Mill — M.D.
LUCAS 3" bar Horiz. Boring Mill — Belted M.D.
LUCAS #3, 3½" bar Horiz. Boring Mill — Belted M.D.
D.&H. 5" bar Horiz. Boring Mill — Floor Type
N.B.P. 38-44" Vert. Boring Mill; side head
CINCINNATI #3 Vert. Miller; Timken bearing
K.&T. #2B, #3B Plain Millers
CINCINNATI BICKFORD 6' Pl. Radial Drill; M.D.
NATCO C-13 Hyd. Multiple Spindle Drill
NORTON 15"x15"x72" Openside Surface Grinder
LANDIS 20"x220" Plain Grinder; M.D.
LANDIS #3½ Int. Hydraulic Race Grinder
BLANCHARD #16 Rotary Surface Grinder; M.D.
HEALD #25A Rotary Surface Grinder
HEALD #60 Internal Grinder; M.D.
GLEASON 6"-18" Bevel Gear Generators
AMERICAN 24x12' Geared Head Lathe; Timken Bearing
ESPEN LUCAS No. 138 Cold Saw — Cap. 12"
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancing Machine
LONG & ALLSTATTER Double Angle Shears
CLEVELAND Model B Auto. Screw Machine — Cap 1½"
POTTER & JOHNSTON No. 8C Semi-Automatic
100 Ton Horiz. Hydraulic Forcing Press
CINCINNATI Gear Burnisher; M.D.

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14" x 8' Sidney, cone
16" x 8' Reed-Prentice, cone, taper
18" x 8' Lodge & Shipley Geared Head, m.d.
18" x 8' Reed-Prentice Geared Head, m.d.
18" x 10' McFarland & Nottingham, cone
20" x 8' Hendey Yoke Head
20" x 10' Hendey Yoke Head
20" x 10' LeBlond, cone
22" x 16' centers (22' bed) American 100 H.P. Input Super Lathe, has power rapid traverse, chip breaker, chip conveyor, 100 H.P. D.C. motor, 6 smaller motors—latest type
22" x 18' Niles, cone
24" x 10' American Geared Head, m.d.
24" x 10' Greaves-Klusman, cone, taper
25" x 14' LeBlond, cone
27" x 16' LeBlond, cone
30" x 14' Lodge & Shipley Geared Head, m.d.
36" x 10' Putnam, variable speed, m.d.
36" x 16' Springfield, cone

MANUFACTURING LATHES

3½ x 36" Lo Swing Geared Head
3 x 80" Lo Swing Geared Head, 2 carriages
8 x 84" Lo Swing Geared Head, 2 carriages
9 x 12" Sundstrand Mfg.
11" x 4' Wells Speed Lathe
14" x 6' Champion Mfg., cone
15" x 6' Automatic Threading, m.d.
15" x 6' Harrington Barrel Turning Lathe
17" x 8' LeBlond Rapid Production Mfg. Lathe
20" x 16' American Geared Head, arranged for spindle boring
NEW Niles-Bement-Pond Quartering Machine, m.d.
Niles-Bement-Pond Axle Lathe, cone
No. 5 Niles-Bement-Pond Center Driving Car Wheel Lathe, m.d.
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2" Bignall, cone
2" Brown, cone
4" Eaton, Cole & Burnham, belt
3" Jarecki, belt
4" Curtis & Curtis, belt
4" Merrell, belt
6" Columbus, belt
6" Landis, m.d. thru gear box
16" Cox, m.d.

UNIVERSAL CYLINDRICAL GRINDERS

16 x 40" Landis No. 3, three motor drive

INTERNAL GRINDERS

No. 6 Bryant, belt
No. 10 Bryant, belt
No. 20 Bryant, belt
No. 72A5 Heald Hydraulic Internal, with extra attachment for grinding tapers in spindle, 3 motor drive

SURFACE GRINDERS

No. 1 Fraser Lapper, 26" plate
14" Pratt & Whitney Vertical Surface, m.d. cap. 12 x 36"
38" x 38" x 12' Gray Planer Type Surface, m.d.
54" Bridgeport Knife Grinder, belt

TOOL & CUTTER GRINDERS

Gisholt Universal Tool, belt-
Gleason Cutter, belt
Gould & Eberhardt Gear Cutter, belt
Landis Chaser, belt

HAMMERS

400 lb. Bliss Board Drop, belt
600 lb. Niles-Bement-Pond Steam
800 lb. Bement Single Frame Steam
1100 lb. Bement Miles Single Frame Steam
Pettengell Bumping, belt

KEYSEATERS

No. 2. Baker, belt
No. 2 Morton, belt
No. 4 Mitts & Merrill, belt
1" Morton, belt
30" stroke Morton m.d.

Send us your inquiries. 1,000 machines in stock.

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No. 00G Brown & Sharpe, single spindle
No. 00 Brown & Sharpe, single spindle
⅞" Model M Cleveland, four spindle
⅞" Model G Gridley, four spindle
1¼" Gridley Model F, four spindle
9/16" National Acme, No. 515, four spindle
4½" Cleveland Model A, single spindle
5½" Cleveland Model A, single spindle

BORING MILLS

148" Betts Vertical, 2 heads
84" Gisholt Vertical, 2 heads
72" Colburn Vertical, 2 heads
60" Bullard Vertical, 2 heads
4" Fosdick Horizontal, Floor Type

BROACHES

HO American Hydraulic, Horizontal
XB10 Oilgear Hydraulic, Horizontal

DRILLS

24" Colburn, single spindle
Barnes Camelback, single spindle, tapping
No. 17 Foote-Burt, 2 spindle
Avey Sensitive, 3 spindle
Leland-Gifford, Sensitive, P.F., 3 spindle
Barnes Camelback, 4 spindle, 2 tapping
No. 11 Natco, multiple spindle

GEAR CUTTERS

No. 70 Fellows Gear Shaper
30" x 10" Maag Gear Shaper
No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

No. 3 Cincinnati Centerless
No. 16 Blanchard, 26" chuck
22" x 48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing.
No. 2 Wilmarth & Marmon Surface
30" Diamond Face, 84" Table Travel
No. 3 Landis Universal
6" x 32" Norton Cylindrical
No. 2 Cincinnati Universal Tool & Cutter
No. 70 Heald Internal
No. 3 Bryant Semi-Automatic Hole

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12" x 5' Hendey, c.d. yoke head
14" x 6' Lodge & Shipley, c.d.
18" x 8' Sebastian, g.h.
8" x 60" Fitchburg Lo-Swing, g.h.
No. 5 x 24" Lodge & Shipley Duo-Matice, g.h.

TURRET LATHES

24" Bullard New Era Vertical, m.d.
36" Bullard New Era Vertical, m.d.
12" Bullard Mult-Au-Matic, six spindle, m.d.
No. 4 Warner & Swasey Universal, g.h.
No. 3H Libby Universal, g.h., 10½ hole
18" Libby Universal, g.h.
26" Libby Universal, g.h.

MILLS

No. 12 Brown & Sharpe, c.d.
Briggs Type A, c.d.
No. 3 Kempsmith Vertical Maximiller, m.d.
No. 3 LeBlonde, c.d.
Model C Becker Vertical, s.p.d.
4" Pratt & Whitney Spline

MISCELLANEOUS

17" Betts Slotter
Pratt & Whitney Design Profiler
No. P2 Ferracute Press
15 Ton Lucas Forcing Press, m.d.

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24" x 24" x 8' American, m.d.
38" x 38" x 12' Niles, m.d.
48" x 48" x 12' Cincinnati, m.d.
96" x 96" x 25' Detrick & Harvey Openside, m.d.

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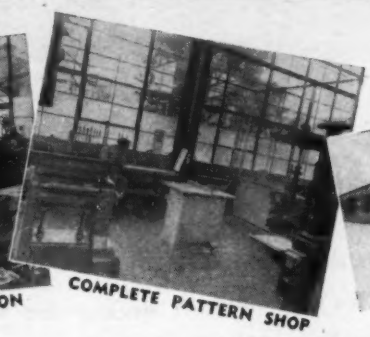
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Converting inefficient machines into VOLUME PRODUCERS

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1—3" Acme M.D. Flat Turret Lathe
3—¼" 4 spdle. Gridleys, M.D. Automatic Screw Machines
1—30"x30"x10' 2 head Powell M.D. Planer
Cincinnati 36"x36"x20' 2 head M.D. Planers
1—B & S #3 Univ. Cyl. 12"x40" cap. Grinder
1—Badger #22I, B.B. Opposed Wheel Disc Grinder
1—Gardner #14 Disc. Grinder. Opposing wheels. Ring Chucks
Cincinnati No. 2 Univ. T. & C. Grinder
1—6' Cin.-Bickford M.D. Radial Drill
1—4' Cin.-Bickford M.D. Radial Drill
1—Cin. 24" Upright M.D. Drill, Tapping Attach.
1—Natco #14 High Speed, Mult. Drill 16"x24" Rect. Head, arranged for 22 spdle. M.D. Drill
1—Robertson Power Saw #4. 9"x9" cap. M.D.
2—Garvin No. 1 Tapping Machines
1—Eames #6 Arbor Press
1—Gisholt Univ. Type Precision Balancing Machine, Special Long frame and bed 28" diam. x 72" long, with Gisholt Recording Amplimeter, M.D.

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Continued from page 276

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700 KVA capacity. Complete accessories, including 3-250 KVA supply transformers, dial feed, 65 series capacitors, over-voltage control, pulsation sequence panel with interlock. All in new condition. Immediate delivery.

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AUTOMATICS, Gridley, 2¼, 4¼ & 5¼" S.S.
AUTOMATICS, Cleveland, 1¼, 1½, 2, 2¾ & 3¾", M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, 2 & 2½" Mod. B
AUTOMATICS, Cleveland, 1½", Mod. M, M.D.
AUTOMATICS, New Britain #22 M.D.
AUTOMATICS, Potter & Johnston #5A & 6A
GEAR HOBBERS, #5A Lees Bradner, M.D.
GEAR SHAPERS, #7 High Speed, M.D.
GRINDER, Blanchard #16 A.B. 5, 30" x 18" Magnetic Chuck, M.D.
LATHE, Steinle Turret, 24 x 4½ & 6¼" M.D.
LATHES, Warner & Swasey #2A & 3A, M.D.
MILLING MACHINES, Becker Vertical, Model N. D. 40" Rotary Table
MILLING MACHINE, Milwaukee, #3 B Plain, M.D.

OTT MACHINERY SALES, INC.
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#1B FOSTER Universal Geared Head Turret Lathe. New in 1930. Motor driven with motor. Equipped with 12" 3-jaw universal chuck.

18" x 3½" LIBBY-INTERNATIONAL GEARED HEAD TURRET LATHE. Machine new in 1926. Motor driven. Equipped with a 16" 3-jaw universal chuck.

J. L. LUCAS & SON, INC.
Bridgeport 5 Connecticut

NEW HAVEN 36" x 22' Heavy Duty, Triple Geared, Internal Geared Faceplate Drive ENGINE LATHE, A.C. Motor Drive.
NILES-BEMENT-POND Horizontal Boring, Drilling & Milling Machine, 4½" bar, Duplex Control, Table Type, with Auxiliary Table, M.D.

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2269 Woolworth Building New York, N. Y.

72" x 48" x 24' Gray Planer—two hds. on rail reversing motor drive

3" bar Universal Horizontal Boring Machine

36" x 36" x 8' Cincinnati Planer—one head — arranged constant speed motor drive

18" Libby Turret Lathe—4¼" hole

4-spindle Henry & Wright Ball Bearing Drills (11)

18" x 120" Type A Norton Grinder completely motorized

24" x 36" x 10' Ingersoll Horizontal Spindle Slab Milling Machine

24" x 24" x 14' Ingersoll Adjustable Rail Miller one vertical head

32" x 37½" x 12' Ingersoll Adjustable Rail Miller two vertical heads

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Chicago 6, Illinois
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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines. Stakes, Spot and Arc Welders.

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Perfected by Richard Brothers Division of Allied Products Corporation, this unit is now widely used in all metal working fields. Standard size square, round or end retainers are of case-hardened steel. The retainer is fitted with a patented ball bearing and spring lock which holds the punch or die securely but permits easy changing without removing the die from the press. Interchangeable punches are of water-hardened steel, rigidly tested and inspected. Carried in stock in a wide range of standard sizes. Special size retainer plates, punches and dies made to order. Write for the complete R-B catalog.

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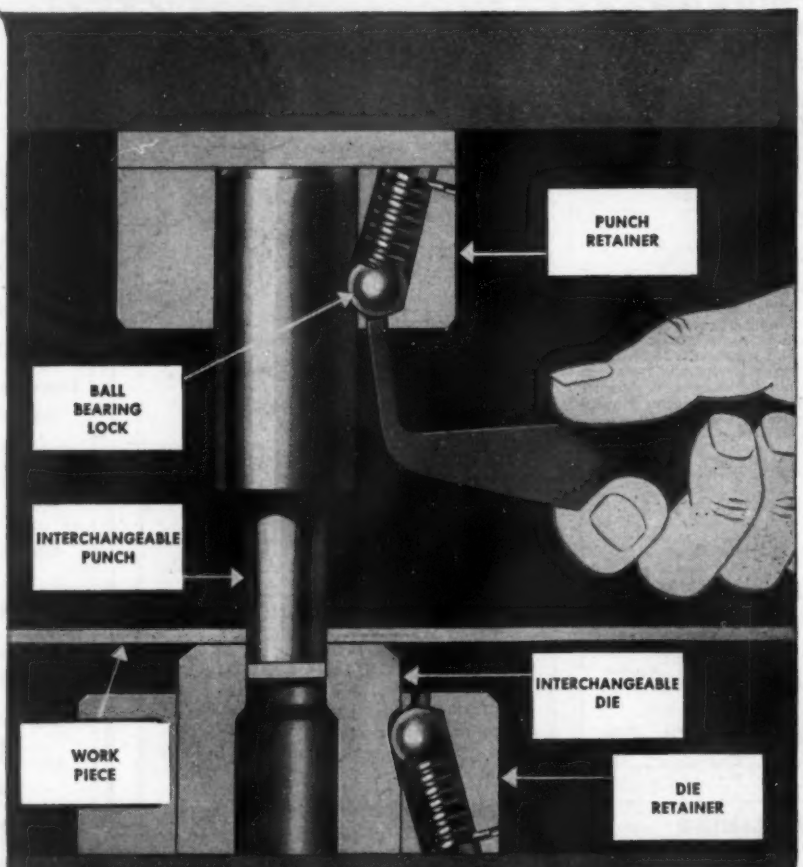

Illustrated above is a complete Richard Brothers Interchangeable Punch and Die assembly showing the method of releasing either the punch or die simply by depressing the ball bearing with the special hand tool provided.

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